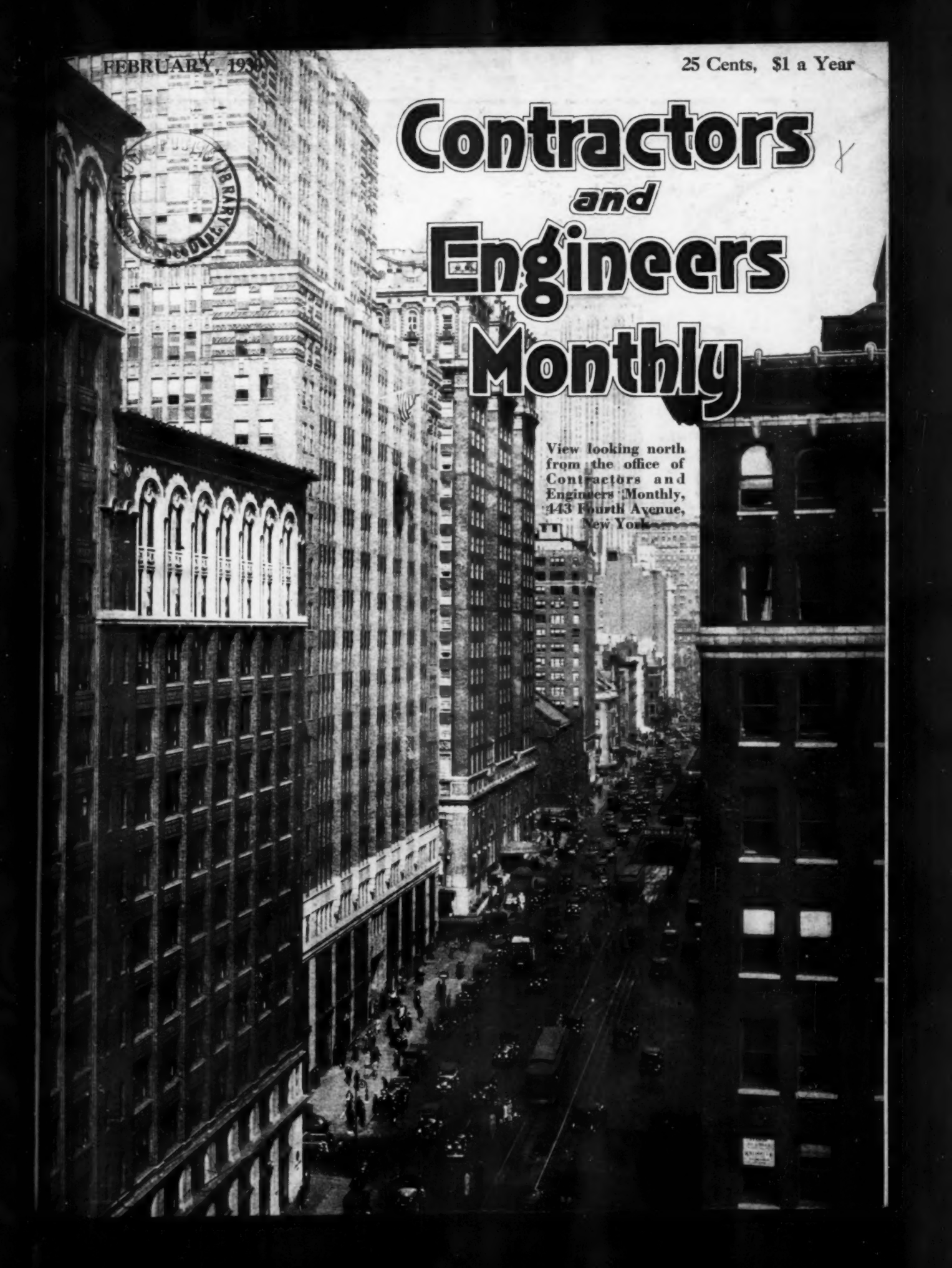


FEBRUARY, 1936

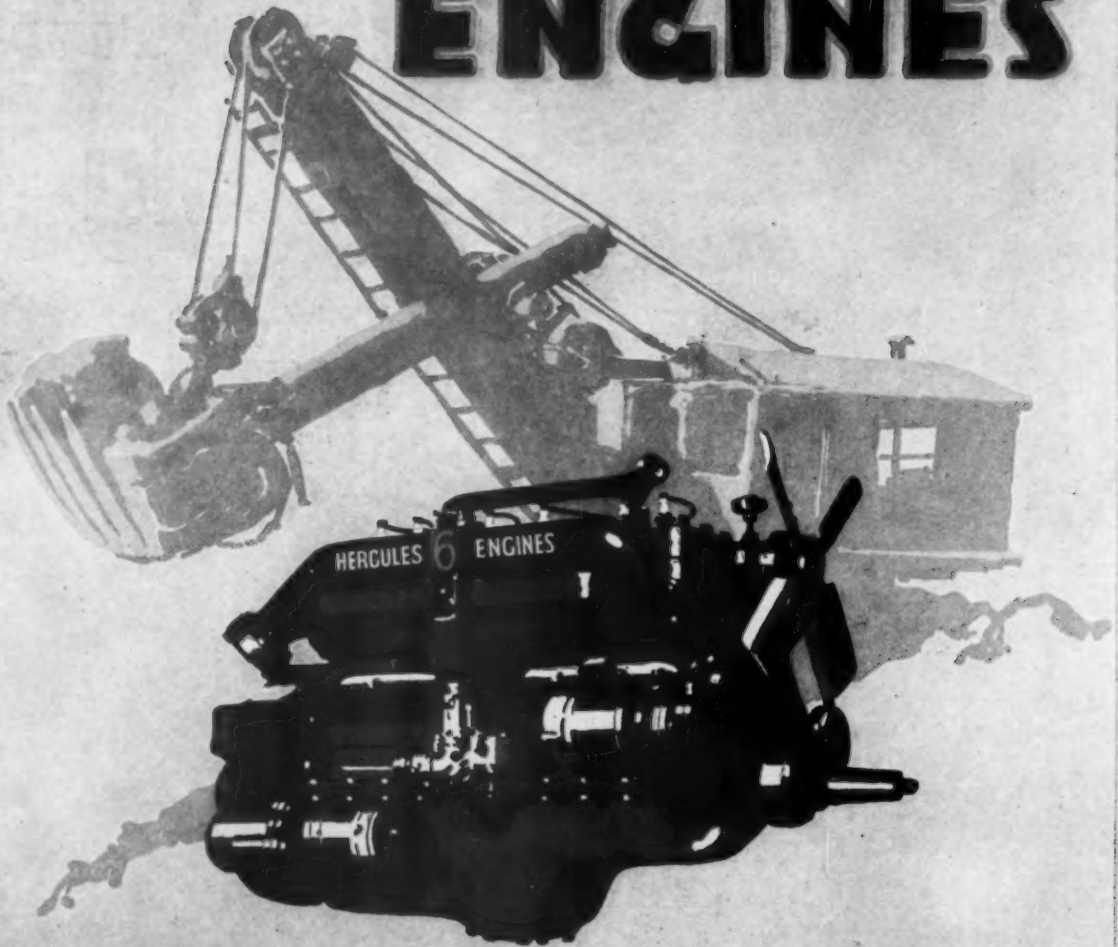
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How the Other Fellow Did It

Construction Briefs

Compartment Drill Car Saves Time

6. In driving a tunnel through the Cascade Mountains a Portland, Ore., contractor used a compartment drill car to good advantage.

The cycle of operations in drifting began with drilling. When the face had been scaled the drill carriage mounting four drills was set up, lead holes were pointed by the shifter and the "Let her go" signal given. Directly behind the drill carriage on the center track was the compartment drill car. No steel was placed on the floor of the drift as the nipper placed the used drill steel in the proper compartment as soon as he received it from the drill helper. With this drill steel car there was no confusion due to sorting steel to find the proper lengths.

When the round was completely drilled, the drill steel car was sent to the drill sharpening shop which was served by trackage directly connected to the tunnel tracks. All used steel was resharpened for the next round. The drill carriage was taken back to the next cross cut while drillers loaded and wired the ground.

16.1.21

Stiffleg Derricks Set Up in Courtyard Cut Labor Costs

7. On a building job in Columbus, the contractor in erecting a structure with a central court 74 feet wide by 93 feet deep set up two stiffleg derricks close to the front wall line and placed so that each could operate within a radius of about 180 degrees. The derricks each had a 110-foot boom and a 45-foot mast. They were set up 35 feet high on three wood bents or towers which had cables looped over them and fastened to anchors in the concrete footings underneath. In addition to these cables, the bases of these wooden towers were weighted down with a carload of paving brick.

These derricks each had a capacity of 4 tons at a radius of 110 feet and 6 tons at a radius of 90 feet. Most of the material for the job was brought in by carload lots, a railroad track being extended into one side of the site and within reach of one of the derricks. Material was deposited in the court by one derrick, and from there the other derrick could reach the farthest side of the building as desired. The masonry materials were handled in wood skips 5 feet square, and concrete was conveyed in 1-yard steel hoppers. With two good engineers operating these derricks, the contractors were enabled to reduce their labor costs to a minimum.

16.3.174

Novel Car Unloading Layout

8. The problem of unloading carloads of sand and gravel rapidly on a very cramped siding was solved in a novel way by a Minneapolis contractor. The plot on which a grain elevator was to be built was completely surrounded by trackage making it necessary to ship all equipment to the job on flat cars. After the foundation had been poured and a small cement storage house built, only a triangular space about 100 feet long and 30 feet wide at its broad end remained for unloading and storing materials to be used on the job. It was necessary to unload 6 to 8 cars of sand and gravel per day. To move a crane to the job would have been a large expense item in itself and even if the crane were there, the storing of the material and transporting of it to the mixing plant would have been rather difficult.

The problem was solved by building a long hopper the full length of the trackage into which the material was dumped and then conveyed to the mixing plant on a gas-engine-driven belt conveyor. A Fordson tractor equipped with a Model B

Baker car unloader was purchased and a runway laid along the hopper to assure good footing for the tractor. The tractor carried an A-frame which was lowered to the side of the car on the other side of the conveyor and the work of unloading started. Only a few hours each day was devoted to unloading sand and gravel. The remainder of the time the outfit was used as a light portable crane. This was done by removing the A-frame from the end of the boom and telescoping the boom to its 12-foot length. A casting on the end of the boom supported a sheave block carrying a cable which attached to one of the drums of the Baker double-drum winch. The outfit was then put to work unloading and piling bulky materials from cars spotted on the trackage opposite the long hopper.

16.2.120

Culvert Pipe Jacked Under Irrigation Canal

9. On an irrigation project in Texas, two 30-inch pipes were installed under a main canal. One of these lines was for a storm sewer and the other for a secondary drainage canal. The importance of uninterrupted water service and of undisturbed canal banks was realized so the jacking method of installation was employed. Eight 20-foot lengths of 30-inch Armco corrugated pipe were selected for the required line. This diameter, while ample from the standpoint of capacity, is smaller than is generally recommended for jacking, as it is rather difficult for a man to work inside a pipe of this size. In this case, however, the diameter between the bottom of the pipe and the canal bottom was only 5 feet and it was thought advisable not to take up any more than half of this by the diameter of the pipe.

Starting in an approach trench at one side of the embankment, men inside the pipe excavated a short distance ahead of the pipe, which was then pushed ahead by means of jacks. This process was continued until by alternate tunneling and jacking, the entire pipe had been pushed into the embankment.

In this particular case the approach trenches were dug first down to the flow line of the two pipes about 9 feet below the surface of the ground for both the drainage canal and the storm sewer. These trenches were about 5 feet wide with practically vertical sides. Short pieces of 6 x 6-inch timbers were then imbedded crossways in the bottom of the trench and to these were spiked two long 3 x 8-inch lining timbers accurately located on the desired line and grade to guide the pipe to the embankment. The approach trench was kept dry by a pump operated day and night.

A backstop was provided, consisting of a 12 x 12-inch timber set on end in the earth at the outer end of the trench and slightly above the level of the lining timbers. The first section of pipe was then rolled into place on the lining timbers and jacking began. To distribute the pressure of the jack evenly over the end of the pipe, an 8 x 16-inch timber bearing block was used. Pressure was applied by a 15-ton track jack and transmitted from the back stop to the bearing block by two 8 x 8-inch jacking timbers 14 feet long and short lengths of railroad ties as jacking blocks.

To prevent ravelling of the soil above the pipe a metal shield was employed. Excavation ahead of the pipe was done with a short-handled adze and a small shovel, the excavated material being removed in a small wooden box with wooden runners. The rate of progress for the first pipe was 1.1 feet an hour and for the second pipe about 2 feet per hour. 16.5.346



(Left)

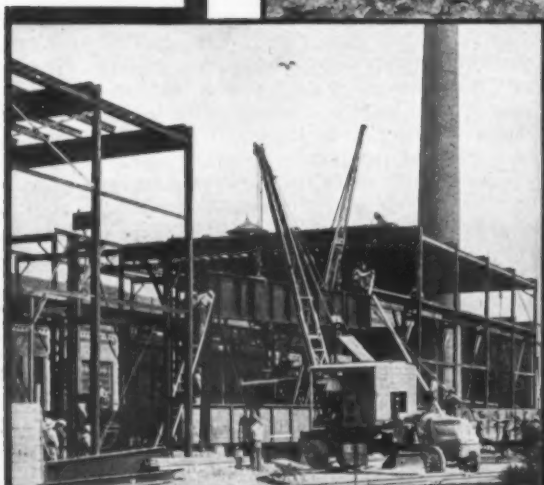
Thompson and Hanson's 1/2 yd. Universal 35 demolishing foundation walls, footings and an old reinforced concrete vault. Site of the new Delaney Bldg., Fort Worth, Texas.

(Below)

Universal 35's are transferable to motor truck mounting where quick mobility is desired.

(Below)

Spencer, White and Prentiss' 1/2 yd. Universal 35 clamshell digging deep wall bearing footings.



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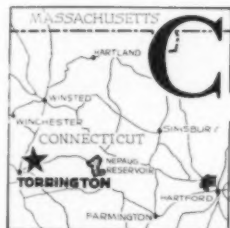
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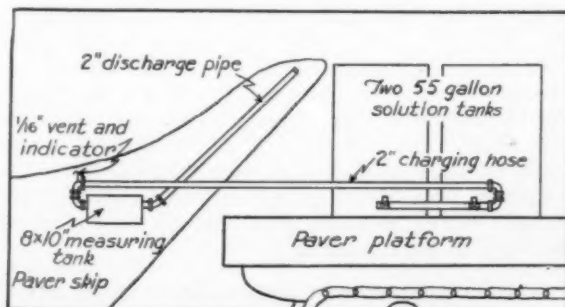
Poured Up Hill in Four Strips



CONNECTICUT specifications require the use of a solution of calcium chloride in the mixing water for the curing the concrete slab. The mixing and adding of this solution is the work of an extra man at the paver on each job. H. S. Sibley, engineer and Joseph Parotti, paver operator, for John DeMichiel & Bros., contractors for the 8,887-foot job running from Torrington toward the Nepaug Reservoir of the Hartford water works, have devised a simple and automatic device for the application of the 2 per cent solution of the chemical as the paver skip is raised.

CONTROL OF CALCIUM CHLORIDE

Mounted on the platform of the Ransome 27-E paver are two 55-gallon drums connected to each other by a 2-inch pipe through short nipples and control cocks. From the front end of the pipe a 2-inch rubber hose runs to a small tank mounted on the paver skip about 2½ feet from the end. The tank which has a capacity of 10 quarts was made by cutting an 8-inch pipe to the proper length with an oxy-acetylene flame and welding caps on either end. At the end farther from the solution tanks a nipple and two angles form a connection for the rubber hose. At the top of this connection there is a small overflow pipe of ¼-inch pipe with the end brought down to a 1/16-inch opening. This acts as a vent for air and shows when the small tank is filled without wasting a quantity of the solution. From the other end of the small tank a 2-inch pipe runs along the outside of the skip to a point where it discharges directly into the mixer drum. The slope of the pipe has been calibrated so that the solution standing in the system including the small tank and pipe is exactly 12



Sketch of the Calcium Chloride Dosing Device Used by DeMichiel Brothers

John DeMichiel & Bros.,

Torrington, Conn.

Uses

Well-Devised Automatic Control for Calcium Chlorine

quarts, the amount of 2 per cent solution required for the 6-bag batch.

The operation of the solution machine is as follows: the calcium chloride operator empties two 100-pound bags of Solvay calcium chloride into each of the two 55-gallon drums and then fills each drum up to a mark on the inside of the drum which will give the correct amount of water for the solution. During this operation the cocks controlling the flow from the drums are closed. As soon as the solutions are ready and the paver is about to begin operations the valves from the drums are opened and the solution flows by gravity into the rubber hose, filling the small tank and pipe along the paver skip to the proper level controlled by the small overflow pipe on top of the tank. When the system is full the solution begins to flow out in drops. No valves are used other than when charging a solution drum and no pumps are needed to give an accurate amount of calcium chloride each time the skip is raised to charge the mixer drum.

When the paver skip is raised the solution runs out of the pipe and tank into the drum of the paver by gravity. Air enters the small overflow pipe thus permitting rapid flow. As soon as the skip is lowered the operation is repeated. The two solution drums permit preparing the solution in one while the other is being used.

The contractor has equipped one of his pavers with this device which has been tested and checked by the Inspector for the State Highway Department many times and found accurate at all times. The other paver is to be similarly equipped as soon as it can be released from service.

ROUGH GRADING

The rough grading on this job involved the handling of 18,000 yards of excavation and 20,000 yards of gravel

fill which was hauled about 2 miles from the bed of the Naugatuck River. The excavation was done by a Thew-Lorain and a Koehring shovel. The grade was smoothed out before rolling by a Galion heavy-duty grader. A Buffalo-Springfield 10-ton steam roller compacted the fill and also was used as needed between the forms to give the final rolling before the slab was poured.

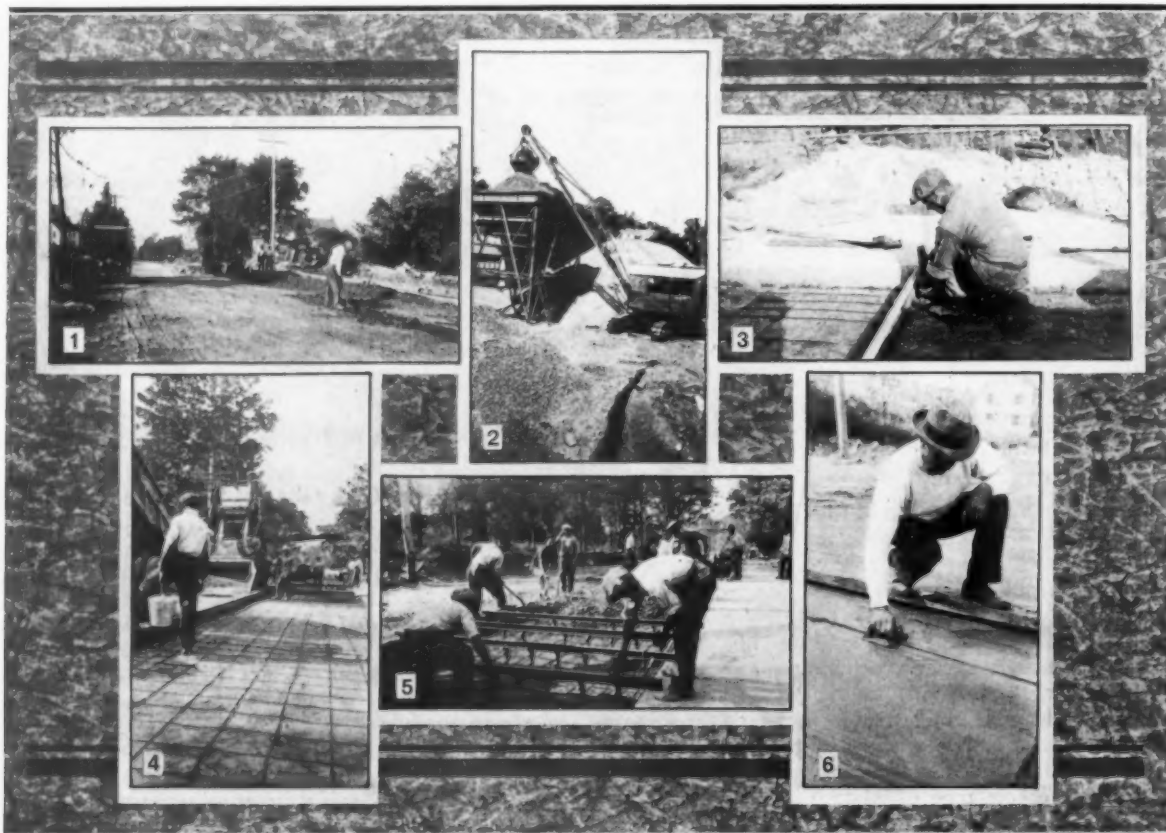
FINE GRADE AND FORM SETTING

Immediately behind the rough grading operations 2 men hand-cut the line for the forms and then the grader

one man attended to the form joints seeing that they were not loose and out of line from being hit by trucks or other machines.

BATCHING PLANT

Sand and stone as well as the cement were received by rail at a siding in Torrington about 2 miles from the job. The aggregates were dumped by the gondola cars into a pit and loaded into the Blaw-Knox bins or to stock pile by a P & H 206 gas crane with a Hayward clamshell bucket. The bins were equipped with Erie



METHODS AND EQUIPMENT WHICH SPEEDED THE DE MICHIEL CONCRETE PAVING JOB AT TORRINGTON, CONN.

1. Preparing the fine grade with a Galion heavy-duty power grader and hand work for form trenches. 2. P&H 206 gas crane with Hayward clamshell loading the Blaw-Knox bins direct from pits beneath the railway tracks. 3. Setting the Truscon steel expansion joint. 4. The well-prepared fine grade with the reinforcing mats in place. The Ransome paver ran up the outer strip leaving the strip being poured free of truck tracks. 5. The cradles which held the reinforcing at the proper elevation during concreting. 6. Edging an expansion joint with the two-handed edging tool.

and a hand shoveling crew of about 24 men trimmed the grade. Then an Acme gas roller with scarifier followed up leaving a firm neat final grade ready for the slab. Inasmuch as the paver ran up the outside strip in each case there was no cutting up of the grade by the heavy batch trucks.

The form setting crew consisted of 4 men who were followed by a crew of 6 men and a foreman giving the final trim to the grade. The contractor maintained about 2,600 feet of Metaforms in good condition on the job and these were kept set about 700 feet ahead of the paver throughout the job.

Two men with a scratch template were kept busy seeing that the grade was exact just head of the paver and

weighing batchers which proportioned the aggregates for the 1:2:3¾ mix. The crew at the batcher plant consisted of one man operating the crane, two men in the cars, a batcher operator and two men in the cement car loading the 6 bags of cement onto the batches in the Mack 3-batch trucks. All the batch hauling was done by hired trucks, 11 of which were used for the maximum haul. On the gravel and the handling of the excavation 18 trucks were used, about one-half of which belonged to the contractor.

CONCRETE REINFORCEMENT AND EXPANSION JOINTS

Two men were employed emptying the bags of cement onto the batches after the trucks had turned and were

ready to back to the paver. No turntable was used. The concreting crew included the paver operator and the calcium chloride man who also sprinkled the sub-grade ahead of the paving, 4 men who shoveled concrete, 2 spaders and one operator for the Ord finishing machine who was assisted by a laborer in shoveling to the screed. The two men who checked the final grade also set the reinforcing steel and the Truscon expansion joints.

The paver was run up hill starting on the left hand of the four 10-foot strips. By adopting this method the paver ran up in the adjacent strip and the trucks were always on the unfinished grade. There was an additional advantage in this method as the American Steel & Wire Co. reinforcing mats could be laid in the strip ahead of the paver and not simply piled alongside and rushed in at the last second before the strip was poured.

The welded reinforcing mats were made up of $\frac{3}{8}$ -inch bars longitudinally and $\frac{3}{16}$ -inch bars transversely. The mats were held in the proper position in the slab below the top by four sets of chair bars which spanned the two forms and had six hooks or chairs to support the mats. The reinforcing was held in the chairs by rods dropped through the top and bottom of the outside chairs. As soon as the concrete was poured to a sufficient depth to insure the support of the mat at the proper depth the chairs were tipped by levers on the outside and moved ahead. The chairs were set on the forms about 3 feet apart.

The expansion joints were set with five iron pegs, the extra peg being on the far side from the paver. The Truscon expansion joint of metal, with no asphaltic material as an integral part of the joint, was set in two 5-foot lengths across the strip. A $\frac{3}{8}$ -inch round bar was dropped into the V-notch at the top of the expansion joint to provide a protection from the grout of the concrete working in as the finishing machine went over the joint. A triangular rod was tried at the start of the work but it was found that the finishing machine had a tendency to pick it up as the screed passed over. With the round rod the screed simply turned the rod in place without disturbing it. The expansion joints were placed 61 feet 4 inches apart.

Three men were employed for the hand finishing of the concrete slab using hand floats and a Lakewood metal straight-edge for checking the surface for inequalities. After the final finish the sides were edged and the joints finished. In edging the joints two Kramer Bros. edging tools were placed the proper distance apart and attached to one handle. A strip of wood $\frac{3}{8}$ -inch thick with one edge beveled to fit the joint and 1 inch deep was inserted in the joint as a guide for the tool. This made finishing of the joints a very fast process and gave excellent results.

With the concreting crew described the paver was able to average 1,200 feet of 10-foot strip upgrade each day. No expansion joints or dowels were placed between the adjacent strips.

The pavement was cured by covering the strip as soon as the finishing was complete and the brush marking done. The strip was covered with burlap which was sprinkled for 36 hours.

DRAINAGE STRUCTURES

As the entire project was on a hill the care of water



Pouring Culvert Headers and Wing Walls with a Ransome Building Mixer

was an important part of the work. Fortunately for the contractor the rain during the months that construction was under way was practically negligible. The designs for the project called for 50 catch-basins with 24 and 30-inch reinforced concrete pipe to carry the water to proper points for disposal and a number of 15 and 18-inch cross laterals. The concrete pipe culverts were set and then the head wall poured later with a Ransome 7-S mixer.

PERSONNEL

The contractor for this project was John DeMichiel & Bros., for which Louis DeMichiel was Superintendent. E. J. Morgan was Inspector for the State Highway Department.

Can Building Contractors Sell?

YEAR by year, the proportion of cars to people increases and it won't be long before there's a car for every man, woman, baby and dog in the United States. The radio distribution is almost as bad. They've been selling radios only a few years now, but everyone's already got one. The total sales on these things have been going up and up and up, while building is doing well to hold its own. Nat Damien, writing about the situation in *Building Age*, says:

"There have been no salesmen in the building industry—just order takers. Contractors believe that it is not 'the thing' to advertise or actually to sell. They feel that such promotional work makes them obligated to the prospect, and in any case, they feel it is not ethical.

"In their minds, the proper thing to do is to sit back and wait for prospects to come in. But prospects don't do that any more. The fellow who's expected to bring in a contract for a new house or some remodeling may never come in. The chances are that he is even now being taken on a sales ride by an automobile salesman, or that he is having his ears tickled by the sales tune of a radio accompanied by the sales talk of a radio merchant.

"Neglected prospects for homes and neglected prospects for remodeling buy radios, automobiles, washing machines, victrolas, and the hundred and one other heavily advertised items.

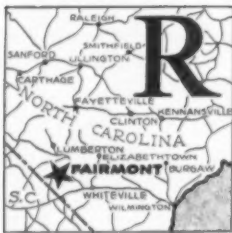
"People are buying these things because of brainy sales methods and honest-to-goodness salesmen. While contractors are waiting for prospective home builders to come around and buy homes, the luxury salesmen are digging up prospects and selling them. They are camping on the steps of everyone who even lets out a whisper that he's a prospect. They wrap blankets around themselves and sleep on the steps. They have their meals brought to them until the sale is made."

Hot Mix Plant Set Up

and

By R. L. Whitehead

Resident Engineer, North Carolina State Highway Commission



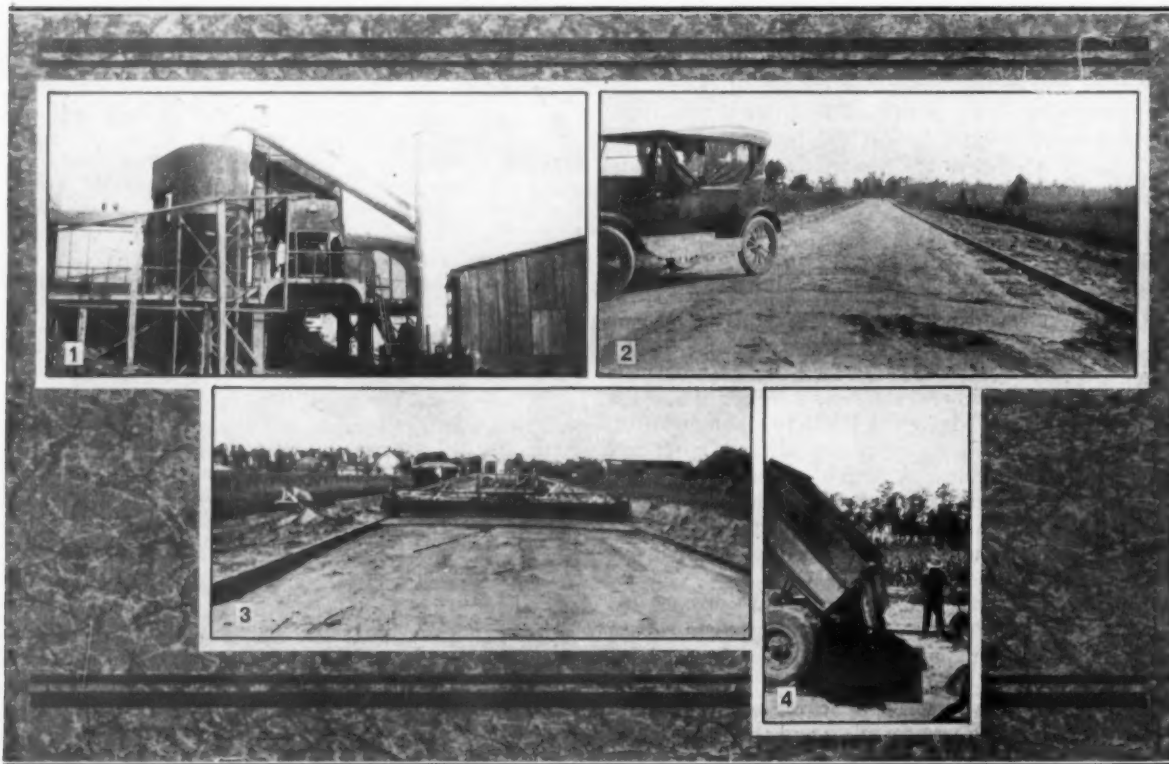
AIN, showers, thunderstorms, thunderstorms, showers and rain held up the progress of North Carolina State Project No. 383 which was awarded to R. G. Lassiter & Co., Raleigh, N. C., the low bidder, on February 19, 1929. The contractor had a particularly good plant set up, used a

Lakewood finishing machine for spreading the sand asphalt, and managed to lay about 4.5 miles of finished pavement before the end of July. The contract called for grading, clearing and grubbing, reinforced concrete drainage pipe and head walls, ditches and the sand asphalt pavement 18 feet wide with a 3-inch base course and a 2-inch top laid for a distance of 9.69 miles from

Fairmont, N. C., to the South Carolina state line in Robeson County.

GRADING

The Lassiter company started a ten-wheeler outfit grading on March 11, handling practically all of the grading in this manner. On June 5 the laying of pavement was begun. All fills were rolled with an 8-ton tandem roller during grading. Some trouble was experienced with 3.2 miles of the grading even after the sand asphalt top had been laid, the contractor placing part of this at his own risk. Settlement of the fills continued after they had apparently been compacted and caused unevenness in the pavement. These were, however, brought up to grade and the pavement relaid. The estimated ditch excavation in the grading contract amounted to 15,000 cubic yards.



FROM PLANT TO ROAD ON THE LASSITER JOB AT FAIRMONT, N. C.

1. The West Simplicity asphalt plant. 2. A good stretch of subgrade showing the forms and the State flivver. 3. The finishing machine ready to start. Note the clean cut joint at the end of the previous day's run. 4. Four tons of hot mix hitting the dump board.

Machine Finishing on a North Carolina Sand Asphalt Job

DRAINAGE STRUCTURES

The contract called for the construction of seven drainage structures including reinforced concrete box culverts, ranging from 3 x 3 feet to double culverts 8 x 9 feet. Because of the character of the country, drainage was a serious problem.

FIELD LABORATORY TESTS

A field laboratory was maintained by the State on the job in charge of an inspector at all times. Sand from the local sand pit was graded daily, penetrations taken on the asphalt and samples of the mixed base and top mailed to the main State Highway Commission laboratory at Raleigh. A roadway inspector was also on the job at all times when asphalt was being placed. The optimum mixture of asphalt, dust and sand was determined in the field laboratory daily.

PROPORTIONING THE ASPHALT MIX

The proportions of the mix were determined by the grading of the mineral aggregate and their void content was:

BASE	
Asphaltic cement	8 per cent
Sand	92 per cent
	100 per cent
WEARING SURFACE	
Asphaltic cement	10 per cent
Limestone dust	4 per cent
Sand	86 per cent
	100 per cent

The asphaltic cement used in the mix was furnished by the Standard Oil Co. through its Charleston, S. C., office and had an average penetration of 45.

The average grading of the mineral aggregates was:

SAND	
Passing 10-mesh sieve.....	36 per cent
Passing 40-mesh sieve.....	33 per cent
Passing 80-mesh sieve.....	23 per cent
Passing 200-mesh sieve.....	8 per cent
	100 per cent
FILLER DUST	
Passing 80-mesh sieve.....	20 per cent
Passing 200-mesh sieve.....	80 per cent
	100 per cent

Owing to the unusual amount of mineral aggregate in the sand passing the 200-mesh sieve, a relatively small amount of mineral filler was necessary to make up the deficiency.

The laboratory analysis of the base and wearing surface was:

BASE	
Bitumen	8 per cent
Passing 10-mesh sieve.....	33 per cent
Passing 40-mesh sieve.....	29 per cent
Passing 80-mesh sieve.....	23 per cent
Passing 200-mesh sieve.....	7 per cent
	100 per cent
WEARING SURFACE	
Bitumen	10 per cent
Passing 10-mesh sieve.....	33 per cent
Passing 40-mesh sieve.....	26 per cent
Passing 80-mesh sieve.....	22 per cent
Passing 200-mesh sieve.....	9 per cent
	100 per cent

The pavement formed by these mixtures gave a very compact base and wearing surface. The average densities were 2.13 for the wearing surface and 1.92 for the base, while the theoretical densities were 2.09 and 1.9, respectively. The sand showed an average of 33 per cent voids. The temperature of the mixes as delivered to the road was around 350 degrees Fahrenheit for the wearing surface and 325 degrees Fahrenheit for the base. The finishing machine used gave better results when working on the maximum temperature limit covered by the specifications.

THE HOT MIX PLANT

A hot mix plant was set up at Marietta, N. C., about 1½ miles east of Station 426 of the job. The plant was a very compact and complete unit designated and manufactured by the Simplicity System Co., Chattanooga, Tenn. It consists of the plant proper, asphalt storage tanks with rotary pumps, filler dust storage house, cold sand feeder and crane.

The power for the sand feeder was supplied by a chain drive from the gas engine. The plant was fed with fine aggregate by a crane with clamshell bucket. The feeder consisted of a hopper built over a track very similar to the tracks used on an ordinary grading tractor and the aggregate carried to it was regulated by a gate which was raised or lowered as might be required. The aggregate was carried from the feeder into the rotary sand drier by a bucket elevator also driven by the plant engine.

The dryer was connected directly to the end of the power boiler which supplied heat for drying and heating the sand. The heat is drawn through the drum from

the boiler furnace by a large exhaust fan and was efficient in heating the aggregate. After the aggregate was heated to the desired temperature it was conveyed by an elevator to a storage bin over the mixing platform. The bin was partitioned into several compartments of various sized aggregates, including filler dust. This filler dust was carried to the bin by an auxiliary elevator from the dust storage house.

The materials from the storage bins were dropped through gates into the weigh box by gravity. The weigh box suspended on spring scales accurately weighed the materials and dumped them into the mixer. The asphaltic cement was pumped to the mixer platform through steam heated pipe lines from the asphalt storage tank installed close to the plant. It was weighed in a bucket which was also suspended on spring scales and then dumped into the mixer with the mineral aggregate. The mixer was of the pug mill type with rotary teeth. A steam operated gate under the mixer allowed the asphalt mix to be dumped into the waiting truck beneath. The operation of the plant was continuous and had a daily output capacity of about 500 tons.

The output of the Simplicity plant was 500 batches of 2,000 pounds each in a 12-hour day. When running base this would give about 1,750 feet of 3-inch compacted base per day. Each truck load of four batches gave about 14 feet of base. When running top 500

batches would give 2,500 feet of 2-inch compacted top, each load of four batches giving about 20 feet. Up to August 9, the average number of batches for 38 working days was 273 boxes, this being rather slow progress, but was due to the inability to get a maximum day's run because of thunder showers and continuous rain.

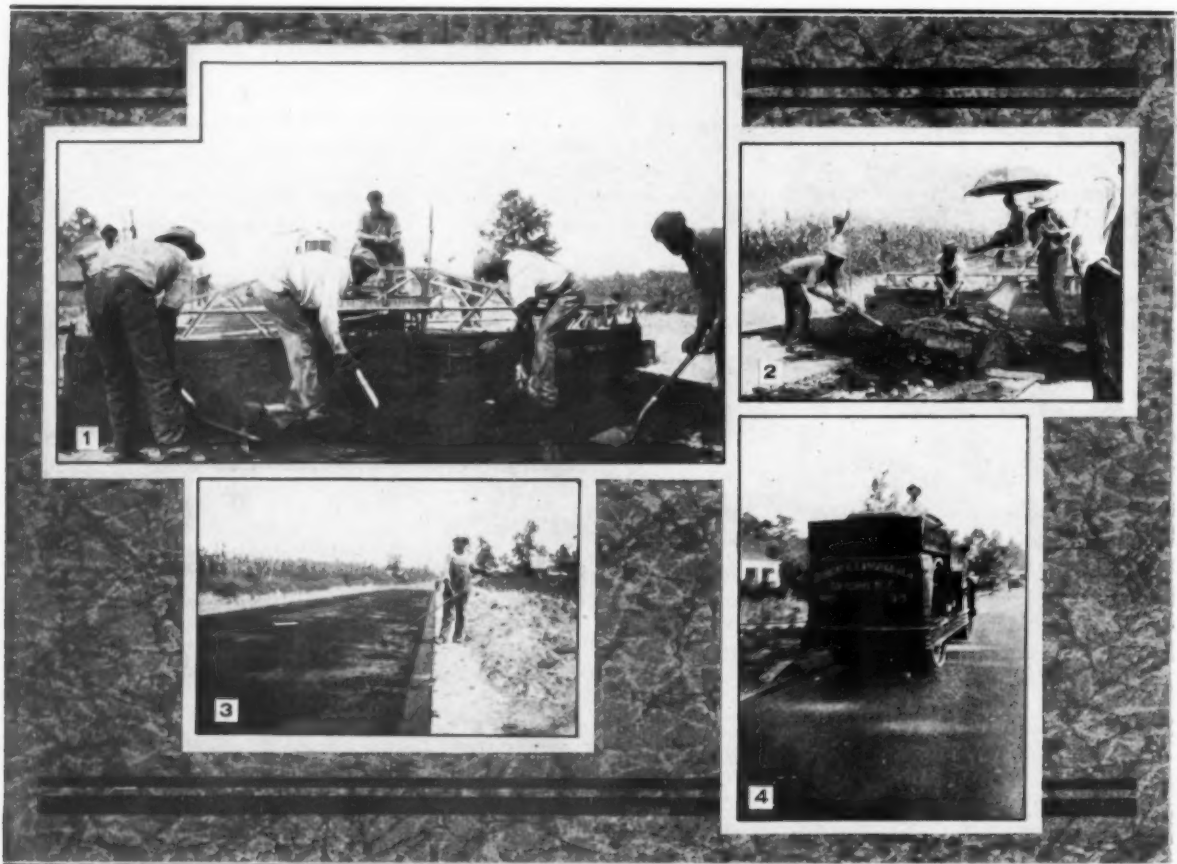
PLACING THE HOT MIX

The contractor sublet the hauling on a tonnage basis and 16 United 2-ton dump trucks were used by the sub-contractor. The average haul of the hot mix asphalt was 6.5 miles. Each truck load was dumped on a metal dump board and then spread to the road by hand shoveling.

Heretofore, hand raking has been used in North Carolina on pavements of this type, but on this project and a few others a Lakewood finishing machine was used. The screed was set to the proper crown and the hot sand asphalt finished in the same manner as a concrete pavement. Wooden forms measuring 3 x 8 inches were used at the sides of the 18-foot pavement and were left in place. After the base course was laid, a squeegee coat of hot asphalt was applied to a thickness of not more than 1/16-inch before spreading the top.

Two 8-ton tandem Buffalo-Springfield rollers which had been used on the subgrade were also used for com-

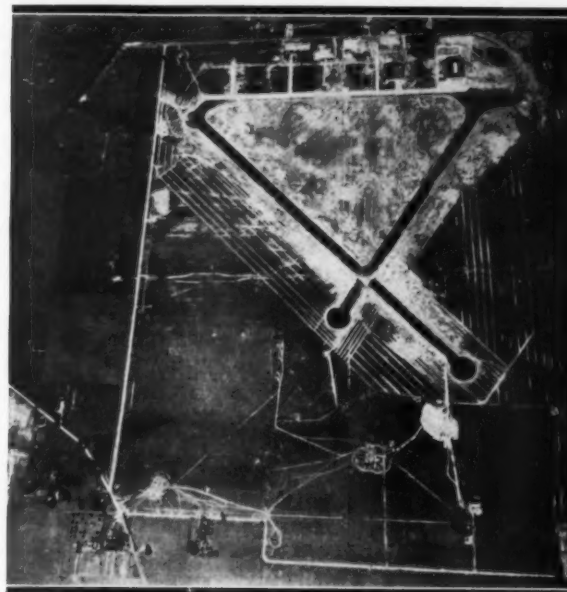
(Continued on page 67)



PLACING THE HOT MIX ON THE ROAD

1. A close-up of a load of hot mix being shoveled from the dump board to the subgrade. 2. A 4-ton load being made ready for the finishing machine to tackle. 3. Part of a day's run after the finishing machine had completed its work and before rolling. 4. One of the Buffalo-Springfield tandem rollers "parked" on boards between rolling periods to keep it from making an impression of the rolls on the pavement.

The Construction of Port Columbus



PORT COLUMBUS FROM THE AIR
The light lines are the drainage ditches.

By R. H. Simpson

Chief Engineer, Department of Public Service,

Columbus, Ohio



ERONAUTICAL experts have pointed out that Columbus, Ohio, is very favorably located for an air terminal. It is south of the snow and sleet belt which spreads over northern Ohio, and is the first large city on level terrain west of the Allegheny Mountains. Between Columbus and the east

coast the area for flying is considered the worst of any section in the United States. From Columbus west as far as the Rocky Mountains the country is level and the conditions for flying are of the best.

When the Transcontinental Air Transport, Inc., selected Columbus as the eastern air terminal, and agreed to use the municipal airport if and when established, the citizens generally became really interested in aviation, and, after an active campaign, funds were voted for the project. The site was selected by a committee, after being approved by government and other experts, including Colonel Lindbergh. It is located about 8 miles east of the business center of the city and can be reached in twenty minutes by automobile, via two main thoroughfares. It contains about 535 acres of land, of which 300 acres have been developed, the balance being held for military and flying school service and for future expansion. The field developed is rectangular in shape, being 4,500 feet long and 3,500 feet wide. It is bounded on the north, east and west by highways and on the south by the joint tracks of the Pennsylvania and Baltimore and Ohio railways.

The terrain is generally level. The east end of the field, where the hangars and other buildings are located, is at an elevation of 816 feet above sea level, and the ground has a total slope, to the west, of only

16 feet. There were several knolls, from 3 to 5 feet high, that were leveled down, and one ravine, from 6 to 10 feet deep and 600 feet in length, that was filled. It will be seen, therefore, that the grading was not a serious problem.

SPEED IN CONSTRUCTION NECESSARY

In the construction of the airport, speed was a consideration of major importance. The Transcontinental Air Transport was planning to start its 48-hour service from coast to coast as soon as possible, and desired to have the work completed or advanced far enough by July 1, 1929, so that it would be possible to operate large transport planes in and out of the port, regardless of weather conditions. Funds for the project were available early in January, 1929, and the problem that confronted the city was to purchase the land and convert it into an airport at the earliest possible date. To do this required the removal of all trees and buildings from the site, the laying of storm drains, leveling of the field, the construction of runways and other paved areas, and the erection and construction of buildings, fences and lighting equipment.

A topographical map of the site was prepared and the general layout of the airport decided. Plans were then started for the sewers, drains, runways, etc., and actual construction was started as soon as the property was acquired, which was about February 1st. In order to save time, contracts were let as soon as plans for a particular part of the work were finished, instead of waiting for the completion of all plans and letting the work to one general contractor. This created some friction between the various contractors later but there



A Lorain 75-B Backdigger Excavating in Shale for the 48-inch Main Drain of Concrete Pipe

was no great difficulty in harmonizing differences and keeping all work going.

THE MAIN STORM DRAINS

The first contract called for the construction of the main storm drains, which afforded an outlet for all surface and sub-surface drainage. This work consisted of 6,600 lineal feet of drains from 18 inches to 48 inches in diameter. The 48-inch drain was reinforced concrete culvert pipe manufactured by the Universal Concrete Products Co., of Columbus. All drains under the 48-inch were of vitrified pipe furnished by the American Vitrified Products Co., of Columbus. The pipe was all hauled to the line of trench by the manufacturer. The depth of trench for the smaller sized drains was from 7 to 8 feet, and for the 48-inch drain from 8 to 17 feet. The excavated material consisted of about 7 feet of clay, underlaid with hard shale. The contractor on this work was Harry L. Hopwood of Columbus. When the work was started the ground was frozen to

a depth of 15 inches and was covered with snow, but before much progress had been made the ground had thawed and at times was too soft from rains to enable material to be trucked to the job. Except for the condition of the ground during the unusual rainy season, the work did not present any serious problem. It seemed to be a question of employing equipment that could excavate the shale.

The contractor selected a Lorain 75-B backdigger with center drive design, on full crawlers, for the work. This equipment has a 24-foot boom with a dipper stick hinged at the end. It backs along the line of trench, pulling the dipper in toward it as it digs. With this dipper the angle can be controlled for the best efficiency, which was a great advantage in digging the shale. A Lorain 75-B crane unit, with 40-foot boom, followed the backdigger closely, and picked up the large tile and laid it to grade in the trench. The crawler feature of this equipment was a great advantage on this job, because of the ability to work over soft ground. The backdigger unit handled the excavation very satisfactorily and it was not necessary to use any explosives to break up the shale.

This work was carried on with about 12 men, including the superintendent and operators. The average amount of 48-inch pipe laid per working day was 60 feet, and for the smaller sizes about 100 feet.

CLEARING AND GRUBBING

The contract for clearing and grubbing was awarded to B. F. Patterson of Columbus. This work involved the removal of about 700 trees, 1,750 lineal feet of hedges and about one-quarter acre of brush. The hedge and brush was grubbed out by hand. The trees were removed by use of a Koehring gasoline shovel. The earth was excavated around each tree with the shovel, and the tree felled by pushing the dipper of the shovel against the trunk of the tree. When felled the trees were trimmed and the trunk cut into convenient lengths, loaded into trucks and hauled away. All roots were cut off below the ground surface. Part of the stumps were burned with tree limbs but most of them were hauled from the site. This work was started early in February and completed about May 1. About 10 men were employed on the work.

The houses, barns and other buildings, 22 in number, were sold by the city to various parties who moved them from the site. Several houses were moved to other locations, but most of them were wrecked and



A Koehring 27-E Mixer with a Hug Truck Delivering a Batch and a Barber-Greene Loader Shown at the Right Working on the Concrete Base for the Port Columbus Runways



Laying the Asphaltic Concrete Surface on the Runways at Port Columbus, Ohio. R. H. Simpson, the Author, Who Had Charge of Construction for the City of Columbus, Is Shown Directing the Work at the Left of the Illustration

the material trucked away to be sold. The city realized only a nominal amount for these buildings.

THIRTY-TWO MILES OF SUBDRAINS

The contract for subdrains was awarded to Kagay & Mann of Richwood, Ohio. The plans called for installing about 32 miles of subdrains. The drainage lines are 30 feet apart in the runway area with a 60-foot spacing on the balance of the field. This tile was covered and trenches filled with gravel to a point 8 inches below the surface of the field. The size of the tile varies from 5 inches to 24 inches in diameter. The specifications called for extra quality vitrified shale drain tile as per A. S. T. M. standard specifications.

The tile was manufactured by the Columbus Clay Mfg. Co., of Columbus. The contractor used two light trucks equipped with pneumatic tires to haul the tile from the plant to the site, where they were unloaded along the line of the ditch, in advance of the excavation. The drains were all laid to grade with a minimum slope of two-tenths of a foot in a hundred. The average depth was about 3 feet and the minimum cover 2 feet.

The trenching was done with two Buckeye ditchers manufactured by the Buckeye Traction Ditcher Co., of Findlay, Ohio. With this equipment the trench is excavated by means of cutting buckets on the rim of a rotating wheel. The grade is maintained by raising or lowering the digging wheel frame. The excavated material is deposited on one side of the trench.

When the tile was larger than the trench made by this ditcher it required about two men to widen the trench, by spading earth from the sides to the bottom, in such a way that the buckets would pick it up. The tile was laid by two men who followed along behind the ditcher. The gravel for the backfill was hauled in dump trucks to the site. Where the field was in condition to permit, it was taken directly to the trench and dumped in place directly from the truck. For much of the work the truck could straddle the trench, the gravel being unloaded through a small opening at

the rear as the truck moved along. A stock pile of gravel was stored along the highway for use when the field was too soft to haul by large trucks. At such times the gravel was transported to the trench on a wagon with a special body, hauled by a tractor. It required about 15 trucks to supply this job with gravel, there being about 5,600 tons used on the work. Two trucks were required most of the time to haul tile to the job. With the exception of this hauling, an organization of only 10 men was required to carry on this work. This equipment proved to be very satisfactory for this work. When conditions were favorable, the ditchers were able to excavate about 2,000 feet of trench per day each. On account of break-downs, bad weather and other trouble, the average was much less.

GRADING AND LEVELING

The work of leveling the field was handled on the basis of cost plus 10 per cent. Most of the excavation



A Buckeye Ditcher Excavating the Trench for the Subdrains at Port Columbus



A Buffalo-Springfield Tandem Gas Roller Compacting the Asphalt Surface on the Port Columbus Runways

was very light, and had to be done at such times as to harmonize with other work. Under these circumstances the cost plus contract was considerably the most satisfactory way to handle the work. The equipment used consisted of Caterpillar Thirty tractors, plows and fresno scrapers. At some points, where the material had to be moved a great distance, a Keystone excavator was used to load pneumatic tired trucks. Heavy trucks with solid tires were used when the field was not too soft. B. F. Patterson of Columbus was the contractor on this work.

PAVED RUNWAYS

The plans called for the construction of two paved runways 100 feet in width; a taxiway 30 feet in width connecting the east end of the runways and a platform 250 feet by 300 feet in front of the passenger station. This pavement consists of a 1½-inch asphaltic concrete surface laid on a 5-inch portland cement concrete base. The runways were 3,500 and 2,500 feet long respectively, and the taxiway about 2,600 feet in length. The runways were constructed to a definite grade and fit the ground surface as closely as possible. The necessary excavation for the pavement was, therefore, light. The work involved the excavation; the laying of tile subdrains; the preparation of the subbase and the construction of 90,051 square yards of pavement.

Where the excavation was very light and the material could be deposited adjacent to the runways it was plowed and moved by scrapers, Caterpillar tractors being used for power. Where the material had to be hauled some distance, a Keystone excavator was used to load trucks. Where soft places were encountered, the soft material was removed and the space filled with large stone. The Caterpillar Thirty tractor was found very convenient to compact the stone in such cases. Five-inch drain tile was laid under the paved areas, the lines being at 25-foot intervals, and the trenches were filled with gravel to the subgrade level. The subbase was rolled and smoothed with a roller.

RUNWAY BASES

The base consisted of portland cement concrete mixed in the proportion of 1 of cement to 8 of aggregate, with a 3-inch slump. The aggregates were crushed gravel and sand from local deposits. All of the aggregates were trucked about 10 miles and stored in convenient stock piles in advance of the work, and at times when the field was in condition for hauling. The cement was hauled from a railway siding about 2 miles from the

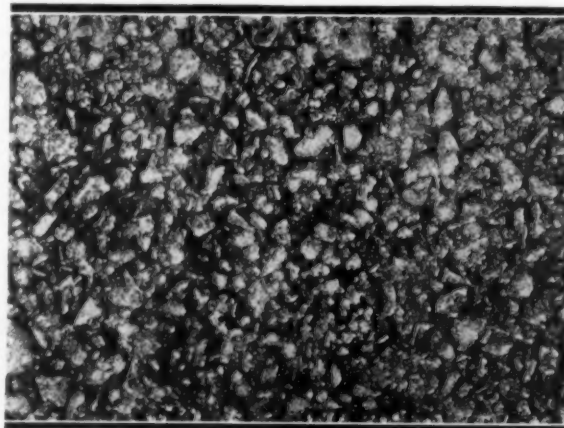
work. The hauling required the use of about 40 trucks for a period of 60 days. Some of the hauling was done at night. A Koehring 27-E concrete mixer was used on the work, and for a period of eleven days two mixers were used working side by side. Barber-Greene loaders handled the stone from stock piles to hoppers, from which batches were emptied into Hug trucks, that served the mixers. It required three trucks to serve each mixer. There were an average of 50 to 60 men on this work most of the time. It required 10 men to supply the mixer and mix and place the concrete. The concrete was placed in 39 working days. The maximum yardage in one day with two mixers, was 4,477 square yards. The maximum for one mixer was 2,480 square yards. The work extended over a period of about 10 weeks, being delayed considerably by rain.

LAYING THE SURFACE

The asphaltic concrete surface consisted of a mixture of limestone and limestone dust from local quarries, lake sand from Sandusky, Ohio, and refined Mexican asphalt. This material was mixed at a standard asphalt plant located about 10 miles from the site; hauled while hot to the job, and laid in the usual manner of laying asphalt surfaces. It required 18 trucks to handle the material from the plant to the site and 20 men to handle the work of raking, spreading and rolling the material. Two Buffalo-Springfield rollers, a 10-ton and a 5-ton, were used for rolling. The asphalt surface was laid in 13 working days, an average of about 7,000 square yards per day. The maximum laid in one day was 9,600 yards. B. F. Patterson of Columbus was the contractor on this work.

HANGARS

The design of all hangars constructed at the airport are subject to the approval of the city, but are erected at the expense of the transport company; except one built by the city. The Transcontinental Air Transport, Inc., and the Curtiss Flying Service, have completed hangars. The former was designed by Love & Sultan of St. Louis and the latter by Geo. Bartlett of New York. The Allied Architects Association of Columbus suggested the architectural treatment of these hangars and acted for the city in approving the design. Both of these structures were erected by the Middle States



Close-up of the Asphaltic Concrete Roadway Showing the Surface Texture



The Hangar of the Transcontinental Air Transport Company at Port Columbus

Construction Co. of Columbus.

All of the hangars are similar in design and the construction methods were practically the same. They are 206 feet in length and 169 feet in width overall. This width includes two towers 22 feet square. They have openings at each end 120 feet wide and 22 feet high in the clear. They are of steel frame construction with steel roof trusses resting on steel columns. The trusses have a curved upper chord. The roof is of composition laid on wooden sheathing. The towers, as well as the side wall, are of buff brick, which are carried up to the window sills. There is a one story structure along one side which houses the heating plant and shops. The floors are of concrete.

The equipment used for erecting these hangars consisted of a traveling stiffleg derrick with a 110-foot boom capable of handling 3 tons at 110-foot radius or 20 tons at 90-foot radius. This derrick handled all of the steel work; all lumber for the roof; all brick used in the tower; and also set the boilers. After completing work on one hangar the derrick was moved north to the second one. The steel for the Transcontinental Air Transport hangar was fabricated by the Bellefontaine Bridge & Steel Co., Bellefontaine, Ohio, and for the Curtiss hangar by the Macomber Steel Co., Canton, Ohio. It required 50 working days to complete each hangar, and the organization consisted of 14 steel workers, 16 brick layers and 15 laborers on general work.

Hot Mix Plant Set Up and Machine Finishing

(Continued from page 62)

pacting the pavement. While still hot and after having been finished with the machine, the pavement was gone over with a 10-foot straight-edge and whenever it was found high or low, it was either cut down or scarified and filled. Sand asphalt in North Carolina is still in the experimental stage, although it has shown itself to be a good durable light pavement.

PERSONNEL

L. G. Huffines was Superintendent for R. G. Lassiter & Co., on this project. R. L. Whitehead was Resident Engineer in charge of the project for the North Carolina State Highway Commission with J. B. Graham as Roadway Inspector and J. E. Platt, Jr., as Plant Inspector. An engineer of the United States Bureau of Public Roads spent considerable time on this project gathering data in the Bureau's study of machine finishing of asphalt paving.

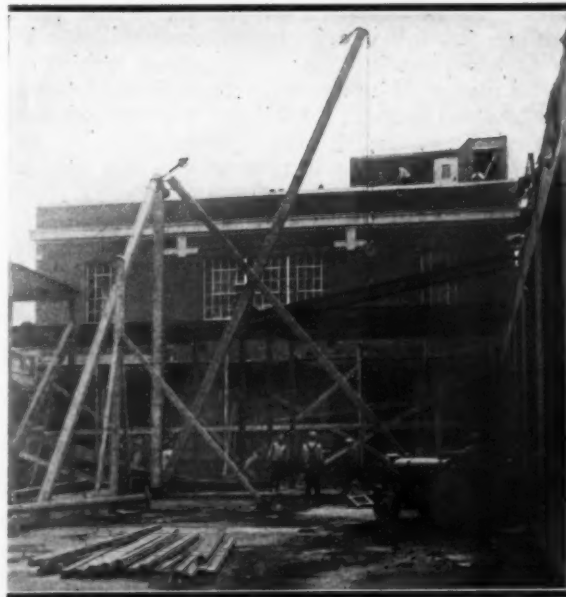
Portable Power Saves Money on Steel Erection

THE practicability and economy of portable power was well demonstrated on a building recently completed by the Morton C. Tuttle Co., Boston, Mass., at the plant of M. J. Whittall Associates, of Worcester, Mass. The structure is a 2-story extension 80 feet wide, the second floor having a framework of steel beams carried on a center line of Lally columns and supported by the brickwork at the exterior walls.

Following completion of the foundations, the brickwork was started and when this had cleared the ground, the first floor concrete paving was placed. This served as an ideal working platform for steel erection.

A stiffleg derrick was set up on blocks on the center line of the structure and was operated by a Fordson tractor equipped with a double drum Hyster hoisting attachment. This rig not only furnished power for the derrick but moved the derrick itself, which was pulled along its supporting blocking by the tractor as the steel erection progressed.

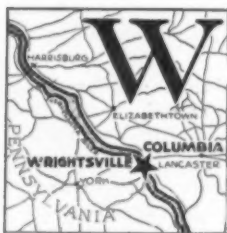
The erection crew consisted of four men handling the steel and one man operating the tractor.



The Stiffleg Derrick Which Was Operated by a Fordson Tractor Equipped with a Hyster Hoisting Attachment

Wooden Trestle Speeds Construction of Multiple-Arch Reinforced Concrete Highway Bridge

By W. C. Fry, Jr.
Resident Engineer



5,420 feet wide. At present the traffic of the Lincoln Highway at this point crosses on a combination highway and railroad bridge owned by the Pennsylvania Railroad, over which quite a number of trains operate daily to the delay and inconvenience of the highway traffic. The new structure will eliminate several grade crossings which have been interrupting traffic at this locality for years.

The placing of twenty-seven piers in this stream, each containing about 1,320 cubic yards of concrete masonry, is in itself a sizable undertaking, but the accomplishment of this in three months is worthy of comment.

DESIGN

The contract plans call for a bridge with an overall length of 7,374 feet, comprising 28 arch spans each 198 feet on the average, center to center of river piers, 20 reinforced concrete girder approach spans approximately 51 feet center to center of piers and several hundred feet of earth-filled approaches. Each arch span consists of three 7-foot parabolic ribs, 3 feet 10 inches deep at the crown and 7 feet deep at the haunches, with a 32-foot rise. The ribs are spaced 10 feet 9 inches in the clear and are tied together at alternate panel points by concrete ties 1 foot 8 inches wide and of varying depths.

One of the unusual features of the floor design is the arrangement and type of expansion joints. The superstructure of each arch span will be completely separated at four points between all piers with $1\frac{1}{4}$ inch

HAT is reputed to be the longest multiple-arch reinforced concrete highway bridge in the world is now under construction, and when completed will carry U. S. Route 30 across the Susquehanna River between Columbia and Wrightsville, Penna., at a point where the stream is

open joints through the jack arches, beams, floor slab, pavement and railing. This is accomplished by means of cantilever beams and two-way slab reinforcement. This construction will eliminate the troublesome sliding joint common in most concrete bridges. The concrete girder approach spans will be continuous over two spans, with four lines of girders on 12-foot 6-inch centers. The bearings of all concrete girders will be steel castings, with fixed bearings at the intermediate support and rocker bearings at the end supports resting on cast steel slabs.

The roadway which will be paved with asphalt block will be 38 feet wide, with one 6-foot sidewalk. Three toll houses, whose architecture will be that of English



A View of the Construction Trestle Showing the Wiley-Whirley Crane and One of the Three O. K. Portable Compressors on the Job



A Wiley-Whirley Crane Aided by a Gasoline Locomotive Moving a Steel Center with the Decking Longitudinally Along the Timber Trestle to a Point Opposite the Next Span

cottages, will be located on each approach plaza.

The bridge was designed for the following loading: floor system, concentrated loads of three 25-ton trucks, abreast or in succession, with a uniform load of 200 pounds per square foot on the remaining loaded area; arches, girders and piers, uniform load of 200 pounds per square foot of roadway, and 80 pounds per square foot of sidewalk area.

FOUNDATIONS

Each of the twenty-seven piers, among which are five abutment piers, was founded on hard limestone of a clay character, the strata of which had been tilted to almost a vertical position in the ages past. The cofferdams ranged from 6 to 11 feet in depth, with water not greater than 9½ feet at the deepest dam. In most cases there was but little covering on the rock which made sealing of the dams more difficult. The cofferdams were of the open type, double-wall construction, 2½ feet larger on each side than the footing itself and the outer wall 5 feet larger all around than the inner wall, the space between the walls being puddled with clay to above the water line. Half of the dams were of the box type with sheeting running horizontally, and the other half of the continuous waler type with the sheeting driven vertically in place.

In the case of the former, the dams were built in sections of inner and outer wall tied together, taken out to the location of the proposed pier, anchored in place and sealed. In the case of the latter type of dam, the walers were framed near the shore, pulled out into the stream, guyed in place, sheeting driven vertically and the dam puddled. What little earth excavation existed over the site of the dam was largely removed by clamshell. Rock to the depth of about 2 feet on the aver-

age was loosened by pneumatic drills and dynamite, broken up by sledges and removed, so as to secure a footing well anchored in rock to resist the pressure from great masses of ice and floods to which the river is subject. Each footing was about 5½ feet deep on the average and contained about 240 cubic yards of concrete. Little difficulty was encountered in keeping the dams dry, a single Mott and McElrath gasoline pump with a 4-inch discharge being sufficient in most cases.

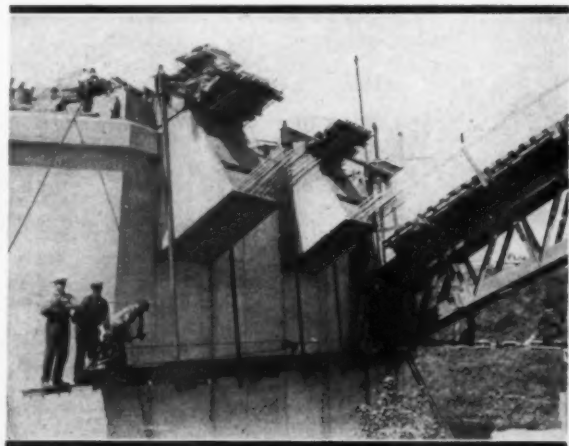
PIERS

The pier shafts, to the upper surface or extrados of the arch, were on the average 32 feet high. The entire shaft was poured in one lift. It had been originally intended to cast the piers in three sections with vertical construction joints, but the idea was abandoned inasmuch as the plant layout and facilities for handling large forms made it more economical to pour the shaft as a monolith. The yard was well lighted and equipped for night work and concreting was carried on twenty-four hours a day during this operation.

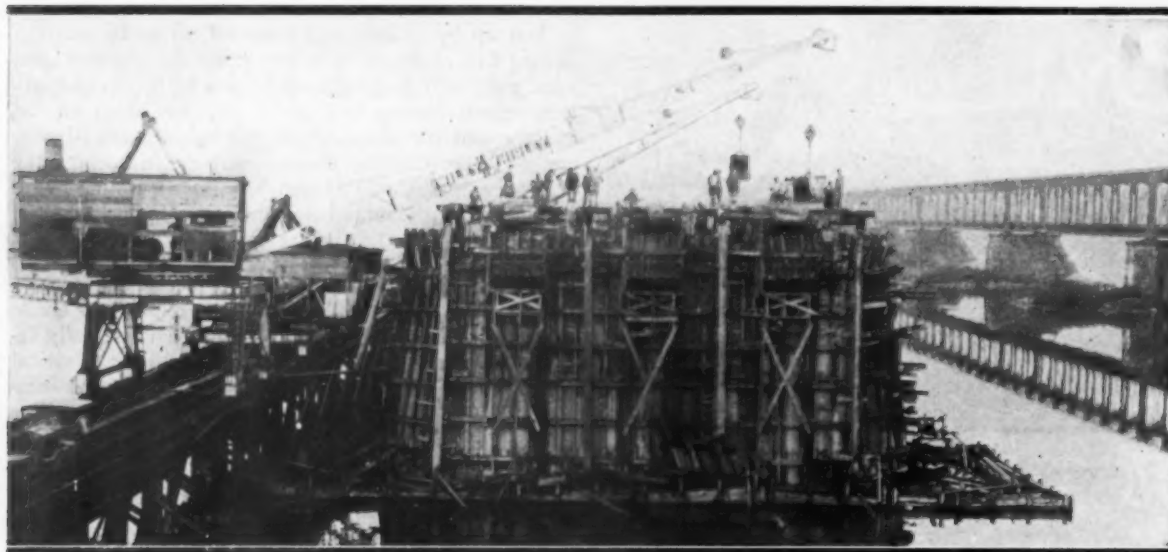
Five complete pier forms were used for the twenty-seven piers, or on an average the forms were used about five and one-half times. Of course, on one or two occasions, they had to be rebuilt or repaired. Forms of this character, which are well designed, substantially built and carefully handled can be used several times, but with each set-up minor repairs are necessary, as they generally suffer some damage in stripping and handling. These forms were built in panels of approximately 14 by 24 feet and so constructed as to be readily removed. It required about two and one-half days to set up, align, rod and place the 15 tons of reinforcement in each pier. The period of concreting required



Shifting the Steel Center from the New Bridge to the Timber Trestle



Moving the Steel Centering of One of the Ribs of the Columbia-Wrightsville Bridge Laterally by Means of a Hand Winch



Concreting a Pier Which Required a Pour of Approximately 1,320 Cubic Yards

about 45 hours, and each pier was allowed to set six days before forms were stripped.

STEEL CENTERING

The centering for the construction of the concrete arches is structural steel. The contractor has provided ten sets for the 84 ribs. The first center was erected on August 13, and the schedule calls for 64 of the 84 ribs completed by January 1, 1930. There are several interesting features in the design of the centering. The centering for each rib comprises two trusses on 4-foot 9-inch centers and a 32-foot rise, tied together by lateral and sway bracing. This ratio of 185 feet span, 32-foot rise and 4-foot 9-inch spacing between trusses presents a center of very slender appearance, with a center of gravity well above the heel. The centering is hinged at the crown, with a tie along the level of the heels acting only during the moving of the center.

The center instead of being supported, as is usually

the case, on bents resting on the footings, is hung from the pier "stub" or "umbrella" which is cast with the pier. This is accomplished by means of four $3\frac{1}{2}$ -inch bolts at each end of the center hanging from a grillage of channels resting on the tops of the umbrellas. In other words, the vertical dead load of the steel center, forms and green concrete in the rib is carried from the center directly through the $3\frac{1}{2}$ -inch hangers to the umbrellas, while the horizontal component is transmitted to the pier itself through a cast steel shoe and a block of concrete poured between the shoe and the pier. As stated before, the center carries a tie of two small channels which functions only during the operation of shifting centers.

As before noted, the vertical load is transferred through the four $3\frac{1}{2}$ -inch bolts to a grillage resting on the top of the umbrella. This grillage in turn rests on two blocks of concrete cast between the grillage and the top of the umbrella to give an even and uniform bearing.



The Blaw-Knox Steel Bridge Forms in Place Ready to Receive the Side Panels on the Columbia-Wrightsville Bridge

These blocks of concrete, together with the grillage, are removed after the center is lowered and shifted to its next position.

After the concrete in the rib forms has attained the required strength of 2,000 pounds per square inch and the concrete in the second span ahead has aged nine days in accordance with the specifications, the steel center may be lowered. This is effected by lowering the large bolts carrying the load to the grillage above until the steel center rests on two channels fastened to the sides of the pier by bolts. These channels serve as a track along which the center is slid laterally into its new position under the second rib. When the second concrete rib is completed and has aged, the center is lowered and moved out along the channels to the position of the third rib. This operation of lowering and shifting laterally to an adjacent rib requires less than four hours.

After the three ribs in one span are concreted, the steel center is moved out laterally from under the arch span, along the channels and across a specially designed steel bridge onto trucks operating on an 18-foot gage track paralleling the center line of the bridge and supported on a wooden trestle. Once resting securely on the trucks, the center is moved out over the trestle longitudinally with the bridge to its respective position between the next abutment piers. This operation of moving the steel center longitudinally and under another span requires about a day.

PLANT LAYOUT

The contractor has made good progress with the aid of well chosen equipment and favorable weather. The contract calls for 101,000 cubic yards of concrete, and from June 12 to November 30, 55,200 cubic yards were placed, or an average of more than 9,800 yards per month. A comprehensive and ambitious schedule was prepared at the start of the job and every effort has been made to keep up with this schedule, the date of completion as set in the contract being February 16, 1931.

In order to complete the work within the contract time, spread out over such a large area, two distinct and entirely separate bases of operation were found desirable. The contractor therefore set up a complete working unit on each side of the river, each organization having its own superintendent, foremen, equipment, sawmill, blacksmith shop, mixing plant, etc. At the outset, rivalry sprung up and has continued throughout the period of work, since not only is the equipment duplicated on each side of the river, but the type of construction is similar. This has worked to the advantage and benefit of the contractor. Each organization started from the shore of the river and worked outward into the stream. So keen did the competition become and so closely did the two organizations keep up with one another, that they met at the center pier in the middle of the river.

Each working unit consists of the following equipment: one Blaw-Knox electrically-operated batcher plant equipped for handling bulk cement, one cement storage bin and elevator, one Wiley-Whirley crane for the unloading of sand and stone from cars to storage piles, three Wiley-Whirley cranes on portal gantries for operation on an 18-foot gage track, one gasoline crawler

crane, a saw mill, blacksmith shop, store-room, etc. In addition to the above, on each side of the river, there is an Ohio locomotive crane mounted and operating on a standard gage track, and on the Columbia side an Erie crawler steam shovel. For the conveying of concrete from the mixer to points of deposit and for the handling of other materials there are three gasoline dinkey engines with trailers.

TIMBER TRESTLE

Immediately upon arriving on the ground the contractor began the erection of a timber trestle, starting from each shore, about 61 feet downstream from the center line of the proposed bridge. The trestle is built of bents with 12 by 12-inch posts, caps and sill, and 4 by 10-inch cross bracing. These bents were set on 16 to 20-foot centers and in most cases rest directly on the rock bottom of the stream. The stringers over the bents were laid in three lines, the outside lines under gantry rails consisting of three 8 by 16-inch timbers held down on the bents with drift pins. Six by 8-inch by 22-foot ties were laid crossways over the stringers. These ties carry one 18-foot gage track on which the Wiley-Whirley cranes, mounted on portal gantries, operate, and a



The East Side Batcher Plant of the Columbia-Wrightsville Bridge

double-track narrow gage line with conveniently located cross-overs. This trestle has carried great traffic since its construction. About 80 per cent of all the concrete in the bridge will be handled over it. The concrete is moved out from the mixer over the narrow gage track on the trestle to the point of deposit, where each bucket of concrete is raised and deposited into the forms through the aid of a Wiley-Whirley crane. The remaining 20 per cent of the concrete going in the approaches is being handled by trucks.

The Wiley-Whirley crane has proved to be a most useful piece of equipment, well adapted to the function it plays on this job. With the heavy counterweight and large 14-foot rail base about which it turns, it can be operated with entire safety with an 85-foot boom in an horizontal position and loaded with a 1-yard bucket of concrete. This great range or radius of 85 feet is just sufficient to serve the far side of the bridge so that it is not necessary to chute any concrete, since it can be deposited in its final position with the use of "elephant trunks" and hoppers only. The large pier and rib forms could not have been handled or set without the use of

these cranes. It likewise played an important part in the erection of the trestle consisting of very heavy bents. Very few forms were built in place. All pier and rib forms, with the exception of the decking, were framed on shore, loaded on cars, moved out over the trestle, and raised and placed by means of the Whirley.

TESTS

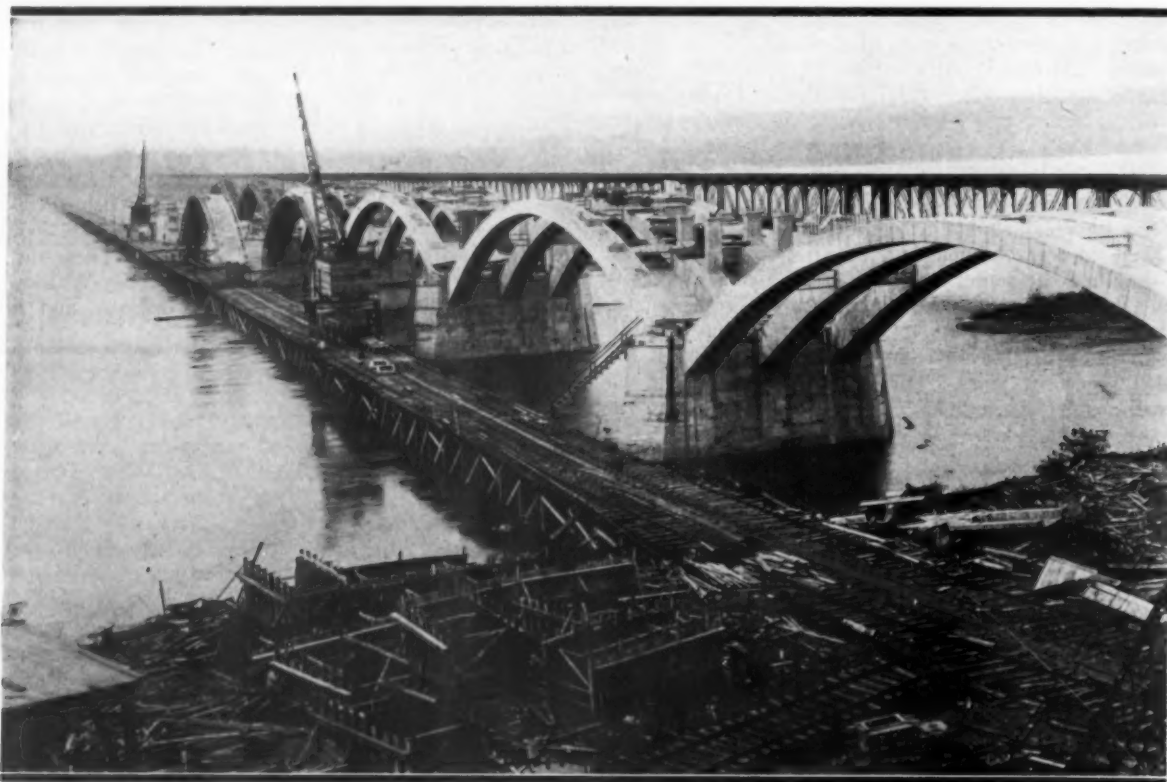
Special effort is made on this job to control the amount of water in the concrete mix in accordance with the specifications. All mixes are carefully designed

the supervision of James B. Long, Consulting Engineer of Norristown, Penna., with the writer as Resident Engineer.

Venice Fills in Her Canals

CANALS 40 feet wide, 6 feet deep with 4 feet of water and aggregating 1.6 miles in Venice have been filled in because of the demands of motor traffic and because the canals were unsanitary.

This is not a desecration of the canals of Venice, Italy, but rather a utilitarian measure in Venice, Calif. The contract for grading and paving was awarded to R. A. Wattson for \$636,203, and the grading was sublet to the Lewis Contracting Co. A



THE TIMBER TRESTLE IN THE FOREGROUND EXTENDING FROM SHORE TO SHORE BESIDE THE NEW BRIDGE AND IN THE BACKGROUND THE COMBINATION HIGHWAY AND RAILROAD BRIDGE WHICH IS BEING USED PENDING THE COMPLETION OF THE NEW CONCRETE STRUCTURE

The side panels for the ribs were built on shore and are shown in the foreground.

according to the water-cement ratio and fineness modulus for the particular aggregates used. Concrete cylinders are made from each mix daily and tested on the job on a 200,000-pound manually operated Olsen compression machine. In addition, 6 by 8 by 30-inch plain concrete beams are molded and tested as cantilever beams to determine the modulus of rupture for each pour of concrete daily. These tests are made on samples 7, 14 and 28 days, and 3 months old. Special effort is directed also toward proper curing of all concrete.

PERSONNEL

The contract was awarded on May 9, 1929, by the Lancaster-York Intercounty Bridge Commission to the Wiley-Maxon Construction Co., Dayton, Ohio, at its lump sum bid of \$2,484,000. The Blaw-Knox Co., of Pittsburgh, is furnishing the steel centering. The structure was designed by and is being erected under

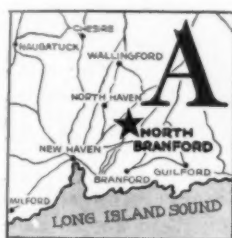
total of 684,342 square feet of asphaltic concrete and 8,175 square feet of portland cement concrete are to be laid, with 21,784 lineal feet of curb and 99,275 square feet of sidewalk.

The northern canals were drained by pumping with an 8-inch Fairbanks-Morse centrifugal pump, and then a small ditch was dug by hand at the bottom of the canal and pumped with Barnes and Domestic diaphragm pumps until dry. A Northwest shovel with a dragline cleaned out the canals in which precast concrete drain sewer pipes were laid.

Plans for the Leipzig Trade Fair

PLANS are now under way for the Leipzig Trade Fair which will be held in Leipzig, Germany, March 2 to 12. There will be more than 100 exhibits of American products designed for European consumption and every effort is being made to have this Fair, which is approaching its 1,400th session, the largest and most successful ever held. Information regarding the Fair may be secured from Leipzig Trade Fair, Inc., 11 West 42nd St., New York.

Compact Concrete Handling Plant for Menunkatuc Dam



As a part of its extensive program to increase the water storage facilities for its supply, the New Haven Water Co., New Haven, Conn., has recently completed the construction of the last large dam for the impounding of waters in the North Branford area northeast of New Haven. An

article in the September, 1928, issue of *CONTRACTORS AND ENGINEERS MONTHLY* quite fully described the construction features of the Totoket dam and the Great Hill and Sugar Loaf tunnels. Now the Menunkatuc dam has been completed to impound the flow of the West Branch of West River, a very flashy stream with a rocky watershed, and deliver the water to the Sugar Loaf tunnel. The Menunkatuc dam will not store water longer than to permit the flow to be drawn down for storage in Totoket reservoir.

PRELIMINARY WORK

The preparation of the foundation for the dam was partially taken care of in the contracts for the construction of the Sugar Loaf tunnel and the siphon in 1928 as it was impossible to construct these two parts of the projects which connect with the dam without clearing the site of the dam. This left only about 2,000 yards of rock excavation in the present contract and no earth excavation. The contract was awarded to C. W. Blakeslee & Sons, Inc., of New Haven, Conn., who were also the contractors for the earlier works connected with this project.

FEATURES OF THE DAM

The gravity section concrete dam is solid except for the 6-foot 8-inch by 6-foot 8-inch horseshoe section conduit running through the body of the structure connecting the Sugar Loaf tunnel with the siphon and having a connection through a 36-inch pipe to the gate house where the flow from the Menunkatuc reservoir will be controlled. The water will be drawn as rapidly as possible from the reservoir and delivered to Totoket reservoir where there is greater storage available. Thus in normal operation the Menunkatuc reservoir will be practically empty. The crest of the dam is 280 feet long with a width of 9 feet at the coping and 8 feet immediately below. The maximum depth of the

Gravity Section Concrete Dam

Built on Flashy Watershed

By C. W. Blakeslee & Sons, Inc.

for New Haven Water Co.

dam is 61.5 feet, and the maximum thickness at the base, 40 feet. The upstream batter is 0.05 and downstream 0.65.

A gate house of concrete with a brick superstructure and red tile roof is located at the east end of the dam to control the flow from the siphon which has been completed but not connected up with the diversion dams which will not be needed to supply additional water for a number of years to come. At the center of the dam is the intake gate house which controls the flow from the reservoir to the conduit leading to Sugar Loaf tunnel and Totoket reservoir. From this same gate house the blow-off pipe is also controlled. At the extreme west end is the spillway which is continued as a concrete paved section for 300 feet downstream running on rock fill on the westerly side of the ravine. In order to construct this spillway it was necessary to rehandle some of the muck from the Sugar Loaf tunnel which had been piled south of the dam site. This material will be piled against the downstream face of the dam, graded, seeded and made into an attractive grassy slope similar to the face of Totoket dam.

A HISTORICAL SITE

Only a few hundred feet below the site of the present Menunkatuc dam the early settlers of Connecticut built a community mill where the farmers had the use of the mill for a certain number of days each year for grinding their corn or sawing their wood. An old rock wall still stands showing the site of the saw mill and at this very location the contractor has placed a very modern electrically-driven air compressor which furnishes the power for the pneumatic drills and grouting machine as well as the hoists for the two wooden derricks and the concrete tower.

Several millstones were recovered and are being mounted in the top of the dam with a bronze tablet

outlining the history of the site. Thus a distinctly utilitarian structure is to be made to preserve the facts of an interesting community development of the early days of the Connecticut colony.

HANDLING OF AGGREGATES AND CEMENT

Stone was hauled by truck from the quarries of the New Haven Trap Rock Co., about 5 miles away. Sand was from a pit purchased by the Water Co., about 6 miles from the dam and which was used on the earlier work after the original pit ran out. Both sand and stone were dumped from ramps for sidehill storage but were retained at the bottom by a wooden wall and bin which fed two conveyors, one for stone and the other for sand. The conveyors ran about 125 feet to the wooden bins above the Ransome 6-bag mixer.

Cement in cloth bags and lime in paper bags were delivered alongside the aggregates at the brow of the hill and slid down a long roofed wood incline for storage. At the bottom the bags were loaded as required onto another Conveying Weigher Co. belt and delivered to the mixer platform.

A 1:2½:4½ mix was used with Alpha cement and the addition of 4 per cent of lime for water tightness. The cement belt ran under the two conveyors for the aggregates, thus keeping the delivery system close together and functioning in harmony. All the belts were driven by electric motors. Because of the form work and the size of the dam the concrete runs were not large, about 250 yards a day being the maximum but by no means the average.

PLACING CONCRETE AND GROUTING

The Ransome mixer delivered the concrete to the bucket of an Insley 120-foot tower from which the con-

crete was readily placed in any part of the structure.

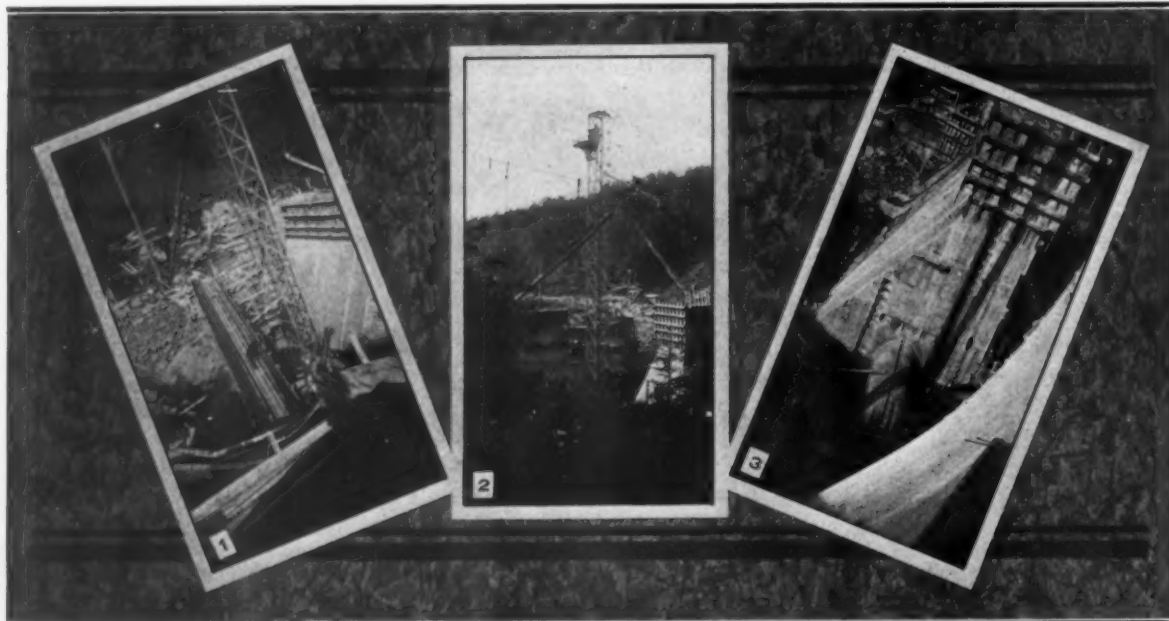
Pipes 1½ inches in diameter were set in the concrete over 3-inch grout holes drilled 15 feet into rock at intervals across the entire length of the dam. The first pipes grouted at the west end of the dam showed a very tight structure, the 100 pounds air pressure on the Ransome grouting machine producing almost no effect in the rock below. On the east end of the dam where the sandstone was quite badly shattered and to take care of any possible leakage through this rock the grout pipes were run through the dam and then turned upstream into the shattered section of rock. These pipes were grouted at low pressure and a large quantity of material was placed in this section. Neat cement was used for the grout throughout.

All cement bags were placed in a shaker and the recovered cement used. An average of one pound of cement was recovered from each bag. This job had a very good record regarding rejected bags returned to the cement manufacturer. There were a few cases where a considerable number of bags of cement were lost at one time through wetting, but during most of the job there were no losses of bags.

SETTING 30-INCH PIPE

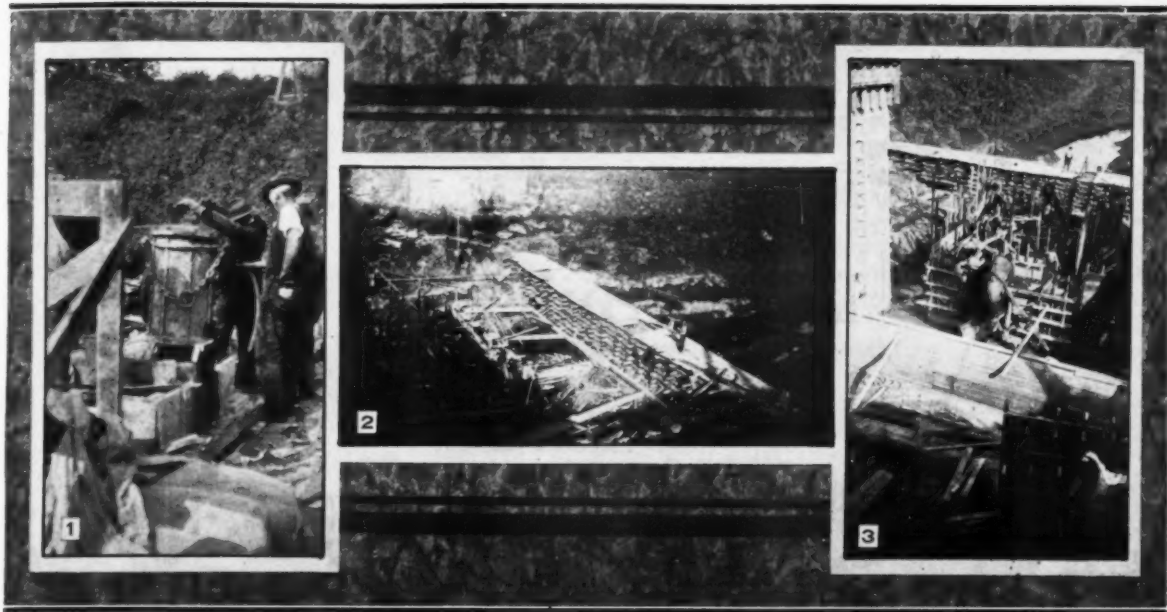
When the 30-inch pipe and gate was being set at the gate house to control the blow-off there was considerable trouble experienced. The pipe floated and much time and several tempers were lost before the pipe was finally set back in its proper place.

The 36-inch pipe from the gate house to the conduit was made in two sections forming an elongated letter S. These were bolted together and temporarily set in place as the forms were being built up. A template was made of the flange of the pipe and the forms bored for the bolts, making a very neat job.



CONCRETE HANDLING PLANT AND FORMS AT MENUNKATUC DAM, NORTH BRANFORD, CONN.

1. Side hill storage of aggregates in the foreground, stone and sand conveyors in center leading to bins, batchers and mixer. 2. Insley 120-foot tower and chutes for placing concrete, seen from upstream side of dam through last section to be closed. 3. Form for center conduit passing longitudinally through the dam and recesses in section of dam cast for keying last section. Forms still in place for top of section last poured.



MISCELLANEOUS CONSTRUCTION OPERATIONS ON THE MENUNKATUC DAM

1. Ransome grouting machine working at 100 pounds pressure on top section of dam. 2. The crib dam upstream which was not overtopped during construction but one flood washed around the end of the structure doing only minor damage. 3. Setting a 36-inch S-connection from the gate house to the conduit.

MISCELLANEOUS

To form the ladder for the wells in the gate house at the east end of the dam so that men could go down to inspect the 36 x 72-inch sluice gates, Everdur bronze bolts were set in the corners of the forms forming a substantial ladder in the corner of the well.

The entire upstream face of the dam was hand-finished as it will be exposed most of the time and it was desired to have it as smooth as possible in appearance. The upper 10 feet of the downstream face was also hand-finished.

QUANTITIES AND COST

The total volume of concrete in the dam is 11,500 yards, all of which was mixed at least 1½ minutes. The first concrete was poured in November, 1928, when for six days there was concrete placed in the bottom of the dam about the blow-off pipe. Concreting was then discontinued until March 25, 1929, when the plant was again started and concrete placed daily until April 5. From that date concrete work was intermittent until August 23 when the forms were ready for almost continuous placing until the concrete work was complete on November 1. The dam was finally completed and ready for use as an integral part of the system of the New Haven Water Co. on December 1, 1929. The cost of the structure complete was \$200,000.

PERSONNEL

The Menunkatuc dam was built by the New Haven Water Co., with C. W. Blakeslee & Sons, Inc., New Haven, Conn., as contractors. The work was under the personal direction of Clarence Blakeslee for the contractors, with W. H. Ryan as General Superintendent. E. E. Minor is General Manager of the New Haven Water Co., and the late Albert B. Hill was Consulting Engineer. Clarence M. Blair was Engineer in charge of construction.

Tractor Shovel Hikes from Job to Job

THE accompanying illustration shows one of two Bay City tractor cranes owned by Ray Baker, Detroit, Mich., loading gravel and crushed stone into a Johnson bin. This work is being done in connection with a large concrete sewer now under construction in Detroit. This shovel was put on the job to replace a ¾-yard full revolving shovel and has handled the work, according to reports, at about half the former cost.

One Sunday morning, Mr. Baker was able to save considerable money by propelling this machine under its own power 2½ miles to a sewer job where it dug a pit 20 feet deep by 8 feet square and then ran the machine back under its own power to its bin-loading job Sunday afternoon so that it was ready to start again Monday morning on the loading job without having taken any time whatever from that work. With a heavier piece of equipment considerable expense would have been involved for hauling the machine from one job to another by trailer.



Bay City Tractor Shovel Peacefully Loading Aggregates the Day After Its Cross-Town Jaunt to Do a Little Digging

Operating Methods for Levee Building with Dragline Machinery



THE closing months, before high water, on the Mississippi River are at hand, and the first working season of the new flood control undertaking is ending from an efficient operation standpoint. Machinery of all types and classes has been used for the levee building problems, and a definite appraisal can now be made of the varied earth handling equipment to ascertain the most adaptable method or methods for levee construction.

Every present or prospective levee building contractor is interested in the figures that cover the past season's operations, and in knowing which system or method of earth handling equipment produced the greatest yardages in the shortest time limit. This knowledge is necessary to any contractor so that he may enter the competition properly equipped to complete the work on time and avoid Government force account.

The machinery installation that is best adapted to meet the difficult weather and ground conditions in an economic manner, is the type of equipment that should establish itself as a future standard for this important earth handling project. The working season is short and the ground becomes soggy and wet with very little rain and equipment must be used that can maintain constant yardages under such conditions to insure completion of the work.

Dependable yardages with large capacity equipment is the outstanding requirement and the equipment used must insure continuous operation regardless of borrow pit flooding and seepage water on the surface. It must be capable of excavating under water and be able to move efficiently over the soft ground without the danger of bogging down. These requirements practically narrow the field of land machines' application to the dragline machine of the long boom type.

A careful and thorough investigation of each project underway at the present time, from a land machinery application standpoint, indicates that the dragline ma-

By

J. C. French

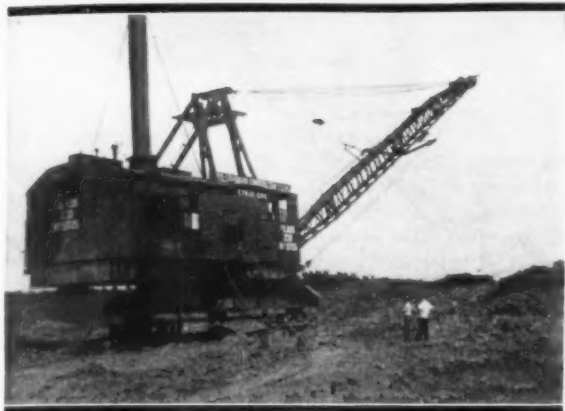
chine of the long boom type is the best universally adapted land tool for the purpose. It has been used for levee building on the Mississippi River since 1912, but its activity has been confined mostly to the work in the lower District, where the levee and borrow pit dimensions have allowed its easy application.

A few machines of the long boom type were used in the upper and Northern Districts as early as 1915, but only to a limited extent. The use was confined to topping the levees after the base had been placed into position by other systems. It has only been during the past two seasons that the long boom dragline machines have been recognized by the contractors all along the River, as the lowest cost land machine method for placing the earth into the levees regardless of whether it was necessary to single handle or rehandle the materials.

REHANDLING OF DIRT ELIMINATED

In adapting dragline machinery to the upper District work, it became necessary for the machine operator to adopt methods to eliminate rehandling of the materials, as the berm and borrow pit dimensions necessitate a longer haul of the materials. The single handling of the materials in the lower District is not found in the upper Districts except in some few instances, and a study of the operating systems and working sequences which will eliminate lost motion in the levee building is in order.

Many systems have been used for dragline operation depending upon the traction device used to propel and maneuver the machine. The rehandle percentage is strictly interlocked with the flexibility of movement and stability of footing insured by the traction device.



Lewis & Chambers, New Orleans, La., Operate This Bucyrus 150-Foot Boom Dragline with a 6-Cubic-Yard Bucket on Levee Work on the Lower Mississippi

It is absolutely necessary for the dragline machine to assume the most advantageous working positions at all times for economic limitations in the rehandling of the levee building materials. The problem of load distribution on soft ground and the ability of the machine to maneuver easily dictate the system that can be used.

Based virtually on the method of traction, there are five distinct systems that can be used for long boom dragline machine operation. The five systems are as follows: the parallel or one line system; the right angle-parallel system; the checkerboard system; the two unit system and the single handle right angle plan.

THE ONE LINE SYSTEM OF LONG BOOM DRAGLINE OPERATION

The parallel or one line system is used when the dragline machines are mounted on either trucks or skid and rollers. These traction mountings necessitate one line operation because of the difficulty of moving so heavy a machine in any direction except straightaway. This system has been adopted during the last years by the oldest machines on the River, namely the skid and roller types but this traction mounting is nearly obso-

lete and the present day one line system is the standard for the truck-mounted types only.

When operation is started, the dragline is placed in position for the first excavation so that the boom reach just covers the estimated riverside edge of the borrow pit. The excavation is started with the machine digging from the deepest part of the borrow pit and swinging the material through a 180-degree cycle to deposit on a spoil bank for later rehandling. The machine moves ahead in a straight line parallel to the levee section for an approximate distance of 1,000 feet building up the spoil bank between it and the levee section. The machine is then maneuvered to a position around the end of the spoil bank to a route between the spoil and the levee section and parallel to both. The next operation consists of rehandling the spoil bank into the landside toe of the levee within the reach of the boom through a 180-degree cycle.

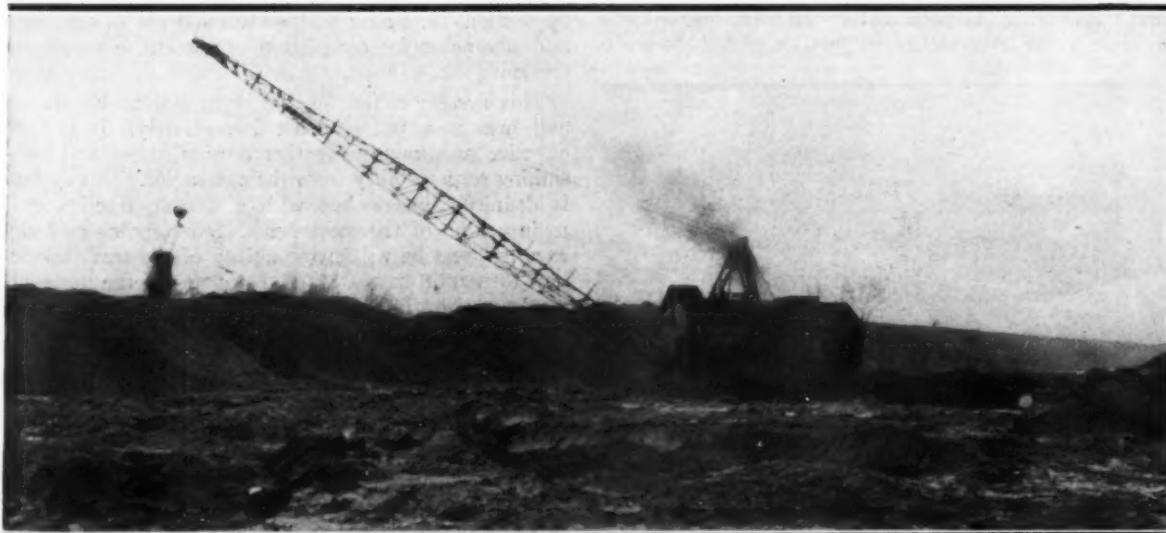
When the spoil bank has been entirely transferred into the levee section, the machine is again swung into a position parallel to the borrow pit and excavation is started from the remaining section of the pit. This earth is placed in the levee section at the riverside toe which results in the building of a dike. This dike plus the dike that has already been erected at the landside toe form a trough for the placing of the center section or core.

The center section or core is placed in position by retracking the machine back along the levee and excavating the remaining earth of the borrow pit and transferring it through a 180-degree cycle directly in place between the two dikes.

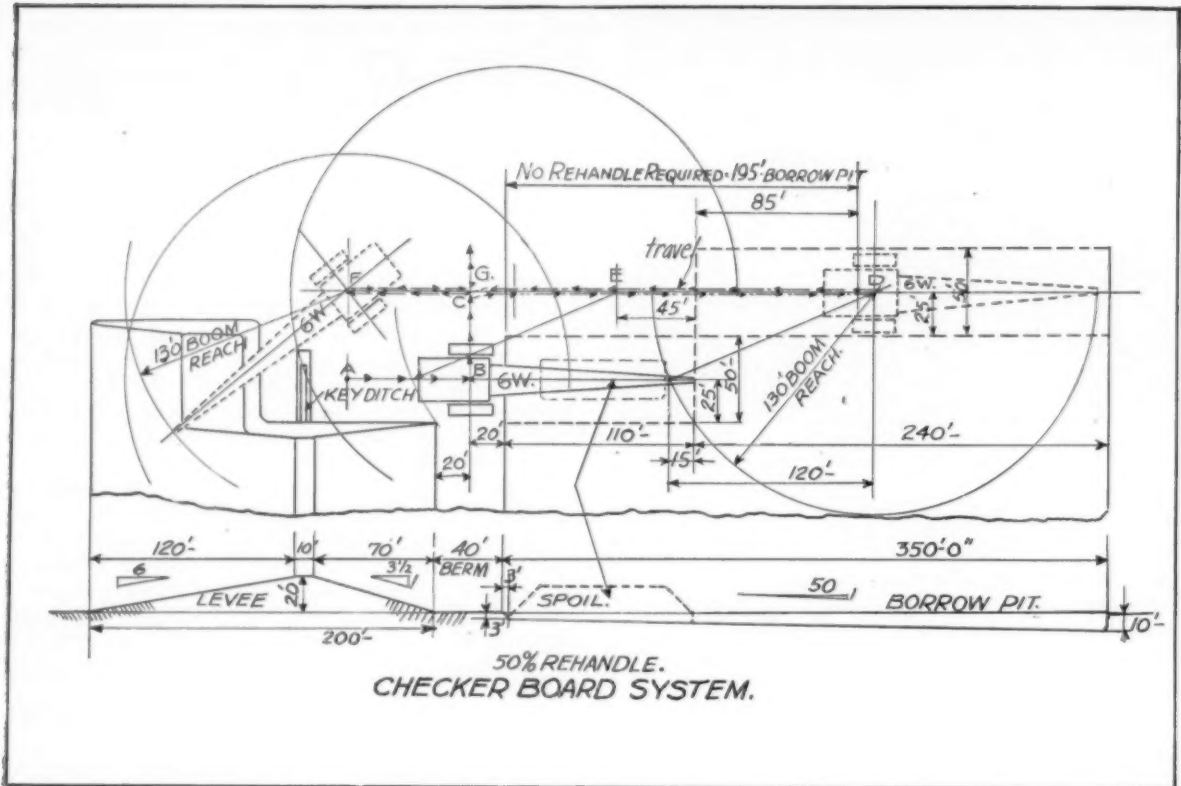
This system or method requires four to five machine settings or retracks, depending upon the size of the levee section and the length of the boom on the machine. It can only be used efficiently in the fourth or lower District owing to the 1 to 10 slope of the borrow pits. The upper Districts have shallower borrow pits and the rehandle percentage would be too great for comparison with other systems.

THE RIGHT ANGLE-PARALLEL SYSTEM

The right angle-parallel system is employed only



A Monighon Dragline Owned and Operated by Roy L. Igo of Hickman, Ky.



when the machine is mounted on a flexible, distributed weight, traction device, and consists of moving the machine at right angles to the levee section, back and forth in a zigzag path finishing each station as the machine progresses forward or lengthwise of the levee.

The dragline is placed in position for the first excavation within boom reach of the extreme riverside edge of the borrow pit and starts the excavation by digging a trench or ditch having a section equal to the estimated volume of rehandle necessary under the existing conditions and borrow pit dimensions. This trench or ditch is dug for a distance of approximately 1,000 feet with the machine moving parallel to the levee section and transferring the material through a 180-degree cycle as close to the levee section as possible within the reach

of the boom. After the 1,000 feet of trench or ditch is completed the machine is maneuvered into a position between the spoil bank and the levee section and the operation consists of rehandling the spoil and transferring it into the landside toe of the levee section. The material is spread so as to build the section to full dimensions by zigzagging the machine as it advances forward.

After this spoil bank has been entirely transferred into the levee section the machine is placed in a position for right angle operation and a pit is opened about 50 feet in width at right angles to the levee section. The earth from this pit is transferred into the levee section by section, beginning at the riverside toe of the levee and advancing for completion of the entire remaining section.

This system completes the levee station by station and insures a full estimate immediately. It is very effective to eliminate weather erosion, slides and levee sinking responsibility from the contractor. This system is definitely interlocked with a flexible traction unit to insure all of the movements. Sidestepping and zigzagging must be within the ability of the traveling device to permit excavation and transfer of the materials as described. The levee construction is faster as the machine is not delayed by tracking or timbering placement which usually delays machine operation of the truck type about two hours each day in preparing the position for the next day's operating location.

CHECKERBOARD SYSTEM

The checkerboard system, is also interlocked with the traction device and consists of opening pits varying in width dimensions at right angles to the levee section. The first position of the machine consists of a location



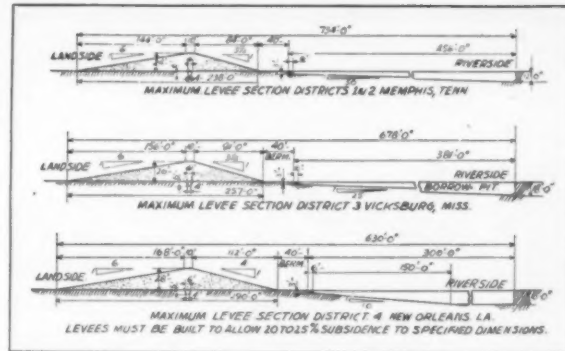
The McWilliams Co. of Chicago Uses This Huge Marion 150-Foot Boom Dragline with a 6-Cubic-Yard Bucket on Its Levee Job—a Close-up to Show the Size of the Machine as Compared to a 5-Pasenger Automobile

within the levee section but just ahead of the levee fill from the last placement. The machine digs the pit width in the borrow pit in front of the levee section and places the earth through a swing of 140 to 160 degrees to the landside toe of the levee. The machine is advancing by steps towards the borrow pit in a line that is at right angles to the levee section. After the machine has reached a position in the center of the berm the excavating of the pit or trench is ceased and the machine moves the trench width in distance parallel to the levee section and moves again at right angles to the levee section to within boom reach of the extreme riverside edge of the borrow pit. Excavation is then started and the material is transferred through a swing of approximately 160 degree to the first dug pit which is used for storage for the spoil bank. The machine advances step by step towards the levee section and excavates and transfers the material into the storage pit until a position is reached wherein the excavated material can be placed directly into the levee. The excavation operation is ceased at a point that is in line with the outer edge of the first dug pit. This arrangement of pits has created the name checkerboard system.

After the excavation of the borrow pit has ceased the machine in moving towards the levee section rehandles the spoil from the first dug pit or storage and places the material into a distributed section of the levee proper. In advancing towards the levee the spoil is rapidly entirely rehandled and placed in position and the machine assumes the position again from whence it started the operation. The next operation is a repetition of the system described.

TWO UNIT SYSTEM

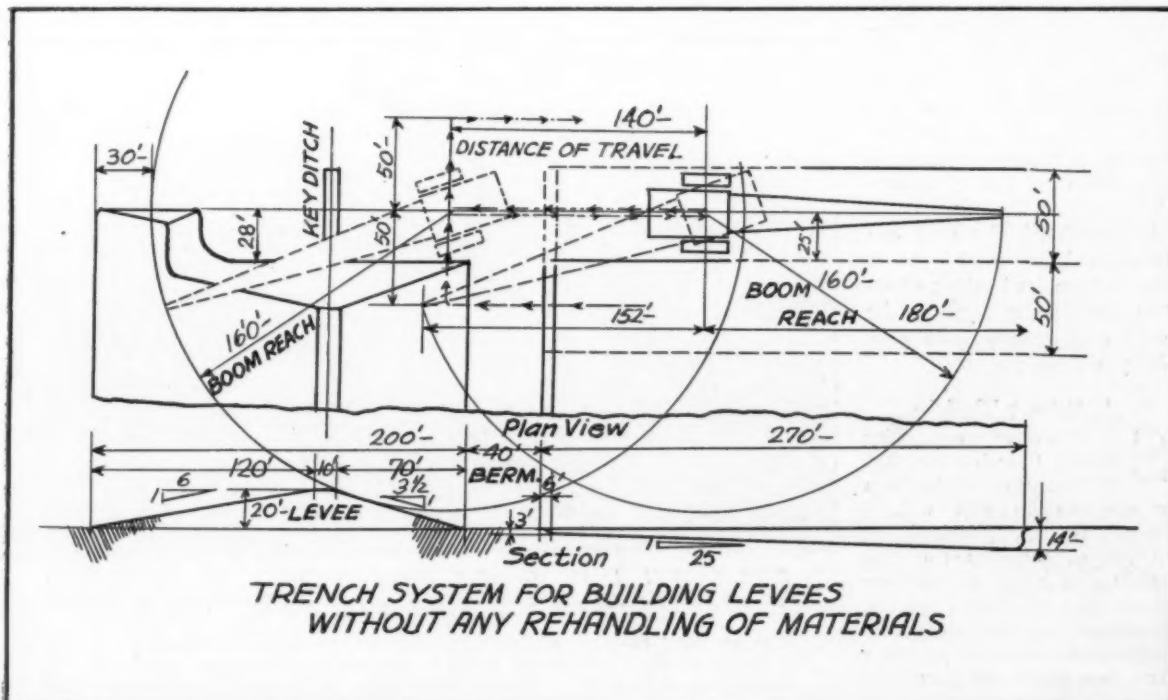
The two unit system consists of working two dragline machines in tandem, one to dig the outer borrow pit and transfer the materials dug to a spoil pile within



the reach of the boom of the other or following machine, and the other machine is located so as to excavate the remaining borrow pit material and transfer it directly into the levee section as well as to rehandle the first machine's spoil into the riverside toe of the levee. This second machine should be of a flexible traction type as it is of utmost advantage to be able to maneuver the machine in a zigzag manner so that the material can be properly spread in the levee section when placing so as to eliminate refinishing by other methods. Any type of traction can be used, however, but tracking will limit the boom reach. The ability of the machine to sidestep allows longer boom reaches for both machines.

SINGLE RIGHT ANGLE SYSTEM

The single right angle system is a variation of the trench system and is used whenever the levee section can be completed with only one handling of the materials. The plan consists of using the operation of the machine as described in the checkerboard system, that is, by digging a trench about 50 feet in width that will extend from the far or riverside edge of the borrow pit





A Monighan Walker Owned and Operated by the Roth Construction Company at New Madrid, Mo.

and will continue towards the levee by steps so as to place the material in sections into the levee sections. This plan allows a single handle of all of the material with levee sections approximately 25 per cent larger in yardage than what could be built if any other plan were to be used. It is extremely important for use in the lower or fourth District and in many sections of the northern Districts.

LARGE CONTRACTS MAKE BIG INVESTMENT POSSIBLE

The large contracts that are being let by the Government for three year completion will allow the purchase of equipment that will insure results and profits. The long boom dragline machine has definitely located itself on the River as the most economical earth handling and transporting land unit, regardless of the levee sections and borrow pit dimensions. Even with a double handling of the material the cost per yard would still be under any other method or system, and the all weather feature with no limitation due to the ground conditions assure the contractor of minimum delays.

The present levee program is of sufficient yardage to interest any contracting company in this country and the challenge extended to the engineering ability of the various contractors, should be accepted to insure a successful conclusion of this great undertaking so that the people of the Mississippi Valley can be assured that the River will stay within its banks and allow the fertile lands to be used continuously each year for profitable crops.

A Silent Talkie

SPEAKING of silent-talking movies, there is a construction company that has been gunning on its jobs with a 16-mm. moving picture camera. It has some movies that talk safety to a group of men more surely than the loudest speaker. Foreigners are particularly susceptible to eye-wise education and these movies are ground for favorable consideration.

Big Mileage of Ditches to Be Cleaned

IN a survey recently conducted by the Agricultural Extension Section of the Explosives Department of the du Pont Co., it was estimated that there are 111,770 miles of open ditches in the United States. Some of these were dug by machine, some in the South, by negro labor, while others in the North were excavated by laborers with pick and shovel. Some states have a great network of such ditches. Ohio has 24,997 miles; Indiana, 17,594 miles; Michigan, 16,142 miles; and Minnesota, 14,823 miles. The state of Wisconsin has 7,000 miles, while Iowa, Illinois and Arkansas have more than 4,000 each. Missouri, Texas, Florida, Mississippi, North Carolina and Louisiana run from 1,000 miles or more to above 3,000 miles. The remainder of the states have varying distances, all averaging less than 1,000 miles.

A feature of the situation is that since the perfection of new types of dynamite and the development of a new technique, such as the so-called "propagation" method of using the explosive, whereby in certain types of soil one dynamite cartridge explodes a whole line, much of the cleaning out work of the ditches is now being done by blasting.

These ditches are all used for drainage, mostly outlets for tile systems. In the figures given are not included new ditches blasted with dynamite to divert the course of streams or to change the course of important waterways for the purpose of saving bridges and roads.

The Prize Winning Bridge

A BRIEF but attractive brochure describing the Sixth Street Bridge over the Allegheny River in Pittsburgh, Pa., has been published by the American Institute of Steel Construction. This bridge was given the national award by the Institute as the most beautiful and artistic bridge erected in the United States and Canada during 1928.

The booklet contains in addition to a description of the bridge a number of illustrations of it, statements by the individuals constituting the jury who made the award telling why they chose that bridge, and the names and photographs of several other bridges which warranted special mention.



ERIE SHOVEL LOADING HEIL EQUIPPED MACK TRUCK DURING EXCAVATION OF BASEMENT FOR THE NEW \$6,000,000 COURT HOUSE IN MILWAUKEE

Wussow Bros., contractors, Milwaukee, recently completed the excavation for the basement of the Court House which is now under construction. Three shovels kept a fleet of from 20 to 30 trucks busy hauling the excavated earth to make land on Milwaukee's lake front

Twin Road Jobs in the White Mountains

By F. F. Hargraves

Division Engineer

State Highway Department

Lancaster, N. H.



NE of the many projects constructed in New Hampshire last year, extended from the Village of Whitefield into the Village of Lancaster. The project was advertised as two separate contracts, both being awarded to the Arborio Road Construction Co., Inc., of Hartford, Conn., who were

the low bidders in each case, out of seventeen bids received.

DESIGN

The type of pavement was a 20-foot roadway of concrete with 3-foot shoulders on either side. The slab was divided longitudinally and transversely at every 50 feet; the thickness being 6 inches converging to 9 inches on the outside 2 feet. The slab was reinforced with steel mesh laid 2 inches from the top. Each end of the slab had a double layer of this mesh extending from the joint 4 feet back. Six dowels were used through each transverse joint with precautions taken to allow sliding during expansion. The pavement was crowned 1 inch and broom finished. The subbase construction was generally an 8-inch layer of gravel, although 12 inches were used in cuts, and all fills from the original roadway beneath the slab was made of gravel regardless of depth.

The original value of the Lancaster job was \$118,664.15 which was increased about 32 per cent in extensions. The Whitefield job had a value of about \$167,000. The total length of the two jobs was 36,788 feet. The two jobs were separated by a stretch of 1½ miles, upon which the Lewis Brothers of Lebanon were constructing concrete pavement similar to these two jobs.

TRAFFIC MAINTAINED

The entire route is a continuous rolling of long, steep grades, ranging as high as 13½ per cent, with grades of 7 to 10 per cent predominating. The greatest proportion of the job was side hill work which confined the machinery and traffic to the 24-foot lane of construction. The conditions of heavy grades and side hill construction presented the usual difficulties, which were very nicely overcome by the contractor.

The nature of the ground was clay, hardpan and ledge. It was by no means an easy job, and it required a good reliable organization and equipment at all times. The traffic was maintained through the job during the entire period of construction by use of telephone service, with but slight inconvenience to the traveling public. Let as two separate projects with a sixty-five and ninety-day limit, the work was completed very close to the time limit. The roadway was open to traffic on both lanes by the middle of September, considerably in advance of the expiration of the time limit.

QUANTITIES

An approximate idea of the quantities involved, are as follows:

Earth excavation.....	23,000 cu. yd.
Ledge excavation	3,500 " "
Borrow	20,000 " "
Trees	150
Gravel	32,000 cu. yd.
Reinf. concrete	80,000 sq. yd.
Class B concrete.....	16 cu. yd.
Class C concrete.....	200 " "
Lin. ft. of culvert (all sizes)....	3,400 lin. ft.
Lin. ft. 12-inch sewer drain....	2,500 " "
Guard rail	6,800 " "
Drop inlet and catch basins....	35

INITIAL ACTIVITIES

As soon as the contract was let, the contractor moved into Lancaster and began clearing and drilling ledge



A Scene on the Lewis Brothers 1½-Mile Job Which Separated the Two Arborio Jobs. This Shows the Original Type of Belt Used by Lewis and Which Was Adopted by Arborio. Note Also the Bags of Cement Stacked Along the Forms. This Is Not Conducive to Speed of Operation

with one crew, while another crew was laying the drainage. Independent of this, another crew soon started setting up equipment preparatory to beginning operations of crushing and screening gravel for use in the concrete mix, local materials being used. The excavating of earth began soon after and was completed ready to gravel the subbase in a short time.

EXCAVATION AND GRAVELING

Although the nature of the country is clay and quite wet, a distinct advantage was obtained by the method of keeping the excavation dumped outside of the slab limit. This allowed maximum loads to be hauled at all times and did not mire the traffic. All the cuts developed soft, wet ground but extra gravel base was figured for the cuts. This gravel was put in immediately after the cut was made, to the advantage of the job and the traffic. To these advantages of handling the excavation and gravel can be added the benefits to future drainage for the pavement.

As soon as the excavation was completed, the work of graveling was carried through to within 3 or 4 inches of finished subgrade. This gravel was very coarse and was hauled as shoveled from the pit. When dumped in the roadway, it was spread by power graders and the extra large cobble was thrown to the shoulders. The soft stone was finally incorporated in the fill. The hard stone was picked up on the Lancaster project and put through the crusher for coarse aggregate. As soon as this operation of subgraveling was completed, the excavators moved on to the Whitefield job to carry out practically the same routine as on the Lancaster job.

PAVING

The paver was next brought into operation. The fine grading of the subgrade ahead of the paver was simplified by the fact that the grade was left purposely low and the rough condition, due to traffic and coarse gravel, was quickly and nicely overcome by hauling in new and finer material and rolling at once. While the paving was in progress, one of the shovels remained in the pit shoveling gravel for use at the crusher and for fine grading. One of the other shovels was converted into a crane for use at the batcher plant loading fine and coarse aggregate.

SHOVELS ALWAYS BUSY

As soon as the pavement was completed, this shovel moved to the Whitefield project to supplement there, while the remaining shovel moved into the borrow pit to complete the work of fill, shoulders, and so forth. At all times the side forms were well ahead of the paver and the fine grading complete within this area. There was always a sufficient quantity of the aggregate ahead for use, and the crushing plant operated but one shift a day. However, quite a storage pile had been accumulated from the early stages of the work. It was necessary, however, to ship in a very few carloads of coarse aggregate from the Maine Sand & Gravel Co., Leed's Junction, Maine, at the very last two or three days. This was anticipated, however, and caused no delay. In Whitefield, no material was imported from outside. A new pit discovered in Lancaster during the early stages of the work, located on the job $\frac{1}{2}$ -mile from the Lancaster end and proving to be a high class pit, was quite a boon to the job.

DESIGNED MIX

The manufacture of the coarse and fine aggregate was a very important factor. As soon as crushing operations were going, a sample of the crusher run was sent to W. F. Purrington, Testing Engineer for the New Hampshire Highway Testing Laboratory, for analysis of fineness modulus. A proper mix was designed and forwarded soon after. The Laboratory had previously determined the material to be satisfactory for use in this class of concrete and the contractor was now able to determine what proportion to stock pile his fine and coarse aggregate. This was done by moving from the coarse or fine part of the pit, as one of the other grades of aggregate tended to get out of proportion. The final results indicated very clearly the value of predetermining proportions.

Traffic was not allowed upon the pavement earlier than seven days, or until it had reached proper breaking strength. This was determined by making four beams each day from the mixer. Breaks were made at the end of seven days to determine the modulus of fracture. Three hundred and fifty pounds to the square inch was the minimum requirement. At no time was the break below minimum and ran as high as 582. However, 390 to 410 were the average breaks; therefore the pavement was open to traffic at the expiration of seven days.

PRODUCTION OF AGGREGATES

The method of handling the aggregates for mix was as follows: the pits were stripped of loam and sub-soil; the run of bank gravel was handled by power shovels into trucks and taken to the crusher less than $\frac{1}{4}$ -mile away. This material was dumped upon a home-made gravity screen, the stone landing upon the crusher platform while the finer than 3-inch spilled directly to the bucket elevator of the crushing plant. This common elevator carried both crushed stone and finer gravel to the revolving screens of the crusher plant. At this point a large stream of water played upon the aggregate, washing considerable of the poorer material and shooting the finer to one side where it was delivered into a long box. This box was rigged up with paddles and with more water where it was properly washed and carried up by paddles into one of the bins of the crusher plant. The crushed stones were run into another bin after being completely washed. These aggregates were dumped by gravity into trucks and hauled to a stock pile a short distance away. This stock pile was located on an incline and all the stock piling was done by simple gravity dumping of the trucks. The stock pile accumulated about 3,000 cubic yards when the paving operation began, and as paving developed the piling of aggregates continued with a slight loss in Lancaster, but at a gain in Whitefield.

BATCHING OPERATIONS

The batching plant was at the very foot of the stock pile and the aggregates conveniently handled to it by one of the shovels converted to a clamshell crane. The batcher plant was equipped with a weighing device which properly determined the proportions. The aggregates were dumped into trucks with three batch compartments. The cement in bags was placed in the compartments when the trucks went past the cement house. They then proceeded to the mixer and dis-



EQUIPMENT AT WORK ON THE ARBORIO JOB AT WHITEFIELD, N. H.

1. Erie steam shovel handling excavation early in the work. 2. The crushing plant. Note the pipe line extending from the right to the top of the bin for wash water. Material dumped by gravity at right. The wash box is on the opposite side of the bins. 3. Fine grading between the forms showing the grader and roller at work ahead of the paver. Water line is seen at the left. 4. A 3-batch truck discharging one batch into the skip of the paver. 5. The paver skip discharging into the drum. 6. The finishing machine at work. Note the use of paper bags for cement.

charged this load. The water was pumped through a 2½-inch water line up and down these steep hills without any difficulty in more than sufficient supply. In Lancaster the water came from the city supply but in Whitefield it was pumped from Mirror Lake.

PLANNING PRODUCES HIGH RUNS

The project operated on a 10-hour day with an occasional 12-hour day put in. The daily output of paving was 1,500 feet of 12-foot slab a day, with a stretch

of 1,800 feet some days, and 2,050 feet was laid one day. The entire work was carefully planned and each operation was scheduled for a certain date. As far as the writer could discern, these calculations must have been carried out quite accurately, for the job progressed very smoothly without any seeming hitch.

MATERIALS

The materials used were as stated, local sand and stone from the Johnson pit in Whitefield and the Chap-

man pit in Lancaster, being supplemented by a few carloads of stone from the Maine Sand & Gravel Co.; Dragon cement in paper bags; Carey Elastite joint; Socony asphalt joint filler; American Steel & Wire mesh; Solvay calcium chloride for surface curing; concrete pipe made by C. E. Buzzell, Randolph, N. H. There was also one corrugated metal pipe with paved invert and coating of asphalt. Apparently very good results were obtained with the calcium chloride method of curing. The season was very dry but checking has not shown up as yet.

EQUIPMENT

The equipment used on these projects was as follows:

- 1 Erie Type-B steam shovel
- 2 P & H No. 600 gasoline shovels
- 1 Buffalo-Pitts 10-ton steam roller
- 1 Buffalo-Pitts 10-ton gas roller
- 1 H-F one-man power grader
- 1 Ransome 1-cubic yard concrete paver
- 1 Ord concrete finishing machine
- 1 Barnes pump
- 1 Blaw-Knox batcher
- 1 Blaw-Knox road forms
- 1 Acme crushing plant
- 1 Good Roads washing plant
- 1 Barber-Greene loader
- 1 belt conveyor
- Several 5-ton Mack trucks owned by Sharp Mossop of Bridgeport, Conn.

ROUTE ONE OF SCENIC BEAUTY

The roadside has been finished to a point where it could be almost termed landscaping. The trimming out of trees has opened up a grand view of the panorama of the mountains and the valleys. The better pavement has made sight-seeing a pleasure. Indeed, this section from Whitefield to Lancaster is one of the most beautiful sections in the heart of the White Mountains. It is along this section where the late Secretary of War Weeks built his famous lodge on the top of Mount Prospect, with a fine road leading up to it, and nearby the modern, first class hotel, Mountain View, owned by Frank Dodge, is located. This locality is dotted with many fine summer mansions and small summer hotels. Along this route through the Gorham Hill Road is without doubt the most beautiful scenery in New Hampshire, and very fitting to be blessed with a permanent road.

PERSONNEL

The successful completion of a job of this size and nature, turning the road over to traffic considerably within the short time limit, is a huge credit to the builders, and a reflection of their intelligent choice of organization and proper reliable equipment. The firm consists of John Arborio, Joseph Arborio and William Lees, who visited and stayed on the job as operations required. The Superintendents left in complete charge were John Dominito and Jack Costello.

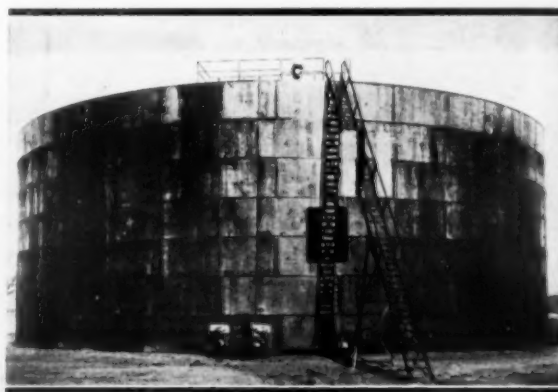
The engineering supervision was in direct charge of the Division Engineer, with the assistance of H. A. Nay, Assistant Engineer, survey party and Inspectors E. J. Swain and Harvey Chadwick, all under the direction of C. P. Riford, Construction Engineer, and F. E. Everett, Commissioner of the State Highway Department.

Accident statistics form the chart by which safety engineers are enabled to steer a saner course in the prevention of suffering.

Speedy Construction Marks Erection of Four 80,000-Barrel Oil Tanks

A CONSTRUCTION project of unusual interest because of its marked speed was the fabrication and erection in forty days of four 80,000-barrel oil storage tanks for the Empire Pipeline Co., Oklahoma City, Okla. This company, noticing the waste and evaporation wrecking havoc with its crude oil, called in the Kansas City Structural Steel Co., to erect storage facilities in the shortest possible time.

A \$1,000 a day bonus and penalty contract was made, the steel company to have the first tank in service in forty-five days and the remaining three completed fifteen days later. Work was started at full speed at once and in forty days the entire job was completed. A total of 1,200 tons of steel went into the four storage tanks.



One of Four Steel Storage Tanks Erected in 40 Days

At Last—Noisy Riveting Made Pleasurable

ABOUT 550 engraved apologies were mailed a few weeks ago by H. E. Ward, President, the Irving Trust Co., to his neighbors in the vicinity of Broadway and Wall Street, New York, asking their indulgence while the 54 stories of the new Trust Company Building on that corner are being noisily riveted together.

The apology states, "May we hope that you will bear with us as patiently as possible during the unavoidably noisy weeks that lie just ahead while the steel frame of our headquarters building at 1 Wall Street is going up? To us, naturally enough, the sound of riveting means gratifying progress toward completion of the building. To our neighbors it means a most unwelcome distraction.

"Realizing this and keenly regretting the necessity for it, we are glad to tell you our builder is pressing the work at top speed. His schedule and the present season of closed windows will at least minimize your discomfort."

According to the New York Herald-Tribune outline, Mr. Ward's neighbors, astonished and delighted at having their indulgence thus invited to his riveting party, have responded in considerable numbers expressing gratification and assuring him that it will be a real pleasure to listen to the riveters.

Accomplishment

THERE is little that the human mind can conceive that is not possible of accomplishment. The man who has done his best has done everything. The man who has done less than his best has done nothing. Never has there been a time in the history of the world when so much opportunity offers for the leading of a successful life as today.

—Charles M. Schwab.

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Lake Champlain Bridge a Notable Achievement

Office of Fay, Spofford & Thorndike

ONE of the large projects recently completed under the supervision of FAY, SPOFFORD & THORNDIKE, 44 School St., Boston, Mass., is the steel highway bridge of the continuous span truss type over the narrowest part of Lake Champlain, between Crown Point, N. Y., and Chimney Point, Vt. The portion of this bridge spanning the lake consists of one continuous riveted steel truss structure, containing a center span having a length of 434 feet with two flanking side spans each having a length of 290 feet, one continuous riveted steel truss structure containing one span having a length of 270 feet and another having a length of 225 feet and one single end-supported riveted truss steel structure and the single span structure each contains two trusses located 18 feet center to center. The three-span structure contains two trusses located 30 feet center to center. The approaches to the lake section of the bridge at each end consist of steel girder viaducts, the girders being supported on steel columns, some of which are hinged to permit longitudinal movement caused by temperature changes. The roadway construction consists of steel beams and stringers supporting a reinforced concrete floor of patented design. The clearance provided under the main span is 90 feet for a width of 186 feet. In order to obtain the required clearance it was necessary to build the roadway with a $5\frac{1}{2}$ per cent grade on either side of the central portion.

Other work now being carried on under the supervision of this firm includes the development of waterfront property of the Intercontinental Pipe & Mining Co., at

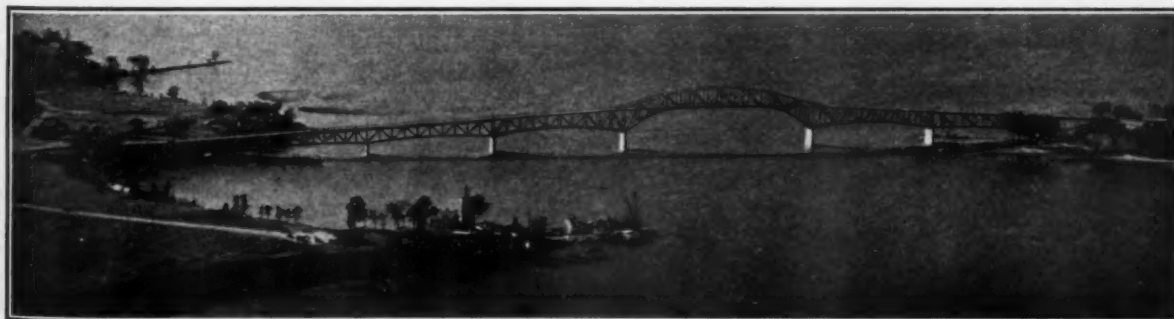
Chelsea, Mass., a storage dam and reservoir at Westfield, Mass., a water supply system at Warwick, R. I., a fire station on Chestnut Hill Ave., Boston, Mass., and other smaller work.

Plans and reports now being prepared in the office include a third unit for the factory for the Warren Telechron Co., at Ashland, Mass., consulting service on the development of waterfront property of the Portland Terminal Co., and on the reclamation of the South Meadows near Hartford, Conn., and work supplementary to the 1925 report of this organization on Great Lakes Commerce and the Port of Oswego, N. Y.

Fay, Spofford & Thorndike is a partnership consisting of Frederic H. Fay, Charles M. Spofford, John Ayer, Bion A. Bowman, Carroll A. Farwell and Ralph W. Horne.

Plans and Reports for Pennsylvania Construction

PLANS and reports on a sewerage system for Clearfield, Pa., on the New Garden Coal Property in Clinton County, Pa., and on extensions to the property of the St. Marys Sewer Pipe Co., of St. Marys, Pa., and the Jefferson Coal Co., Coal Glen, Pa., are among the present activities in the office of E. W. Hess, Engineer, 2-6 Murray Bldg., Clearfield, Pa. This organization also has an office at 400-401 Deposit Bank Bldg., DuBois, Pa., which is under the supervision of O. P. Hess, associate engineer. R. C. Kindig is associated with Mr. Hess in the Clearfield office.



The Completed Lake Champlain Bridge Between Crown Point, N. Y., and Chimney Point, Vt.

Photo by Fairchild Aerial Surveys

The Consulting Engineer

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Plans for Municipal Projects

PLANS are now being completed by GORE, NASH SMITH & STORRIE, 342 Confederation Life Bldg., Toronto 2, Ontario, for a duplicate water works for the city of Toronto, which is to cost \$14,317,000; a water works for the city of Calgary, Alta., costing \$3,770,000; a filtration plant for the city of Belleville, costing \$200,000; filters for the city of Ottawa, to cost \$1,315,000; and a sewage treatment plant for the city of Kitchener, Ont., to cost \$357,500. The water works system for Toronto and the filtration plant for Ottawa have already been placed under construction.

H. P. Williams, Vivian Hunter and Thomas Brodie, engineers, and Guy Quartermain, an architect, have recently joined the staff.

Consulting Briefs

Hall & Withington, Centerville, Iowa, is now working on a report and plans for drainage work on Steel Creek in Decatur County, Iowa. This firm is also supervising drainage work in the Grand River in Decatur County, Iowa, and has been called as an expert witness in the litigation between the Town of Sharon, Iowa, and the Western Asphalt Paving Co. During 1929 this company supervised paving work in the following towns in Iowa: Lamoni, Olds, Mt. Pleasant, Brighton, Donnelson and Richland. They also had charge of drainage work on 2 miles of Little River, Decatur County, Iowa.

Harry E. Reddick, consulting engineer, Santa Paula, Calif., has charge of the supervision of a program of municipal work, including street paving, sewer extensions and ornamental street lighting for the city of Santa Paula, Calif.

N. H. Nelson, Morro Bay, Calif., is at present engaged in preparing reports and plans on a sanitary sewer, water and paving project in San Luis Obispo County, Calif. This organization also has several other projects in the formative stage.

H. A. Marshall, Room 6, Smith Bldg., Topeka, Kans., reports that he is now preparing surveys and plans for a county highway system for Miami County, Kansas. This improvement will consist of grading, draining and surfacing with sand. The cost, excluding bridges, is estimated at from \$4,000 to \$8,000 per mile.

Nicholas D. Fazia, 441 E. Tremont Ave., New York, N. Y., is now acting as the engineer in charge for the Scalera Contracting Co., contractors for the construction of a section of the Saw Mill Parkway from Worthington to Elmsford in Westchester County. Mr. Fazia also acts as expert witness in litigation involving earthwork measurement and calculations.

A. J. Hammond, 120 South La Salle St., Chicago, Ill., is now engaged on reports and plans for a railroad and street grade separation project for Cedar Rapids, Iowa. A new building for the Davies Laundry, Chicago, is now under construction under the supervision of Mr. Hammond.

M. A. Fouhy, consulting engineer on structural work, moved his office on November 1, 1929, from 45 West 45th St., to 475 Fifth Ave., New York. He is now completing plans on the Falk Clinic, which is now under construction in Pittsburgh, Pa., and for which E. P. Mellon and W. L. Smith are the architects.

C. M. Ayres, 911 Merchants Bank Bldg., Tuscaloosa, Ala., reports that his son, C. M. Ayres, Jr., a graduate in chemical engineering from the University of Alabama and a 3-year student in architecture at Cornell, has recently joined his staff. This firm is now preparing a report and plans for revision of coal mine operations for the Seaboard Coal Mining Corp., Tuscaloosa, Ala.

The Standish Engineering Corp., 400 N. Michigan Ave., Chicago, Ill., is supervising work on the Detroit River Canadian Bridge Co.'s International bridge at Trenton, Mich., which will cost approximately \$4,500,000, and on the \$1,500,000 bridge across Apalachicola Bay, Apalachicola, Fla. This firm is frequently called upon for expert testimony on bridge, dam, foundation and water construction projects.

Sanitary Projects in Westchester County, N. Y.

Office of W. W. Young

AMONG a number of projects in several states on the boards in the office of W. W. YOUNG, 90 West Street, New York, is the network of trunk sewers which, at a cost of upwards of fifty millions of dollars, the Westchester County, N. Y., Sanitary Commission has, with Mr. Young as their consulting engineer, had the foresight and courage to design and in large measure already construct.

The recent study of sanitary conditions in Westchester County by Mr. Young developed the fact that the interior of the county, except about 30 square miles in the Bronx Valley, was without adequate sewage disposal facilities, and its development was greatly retarded because of that fact. It also showed that many of the municipalities along the Hudson River and Long Island Sound were polluting the adjacent waters and developing unsanitary conditions by discharging untreated or partially treated sewage into them. The remedial plan adopted provides for the development of fourteen projects, which include trunk sewers and treatment plants. The seven additional projects described below are built or planned for immediate construction.

The Blind Brook project serves an area of 5.4 square miles in Rye and Harrison, with an assessed valuation of \$54,000,000, and an estimated maximum daily transient population of 200,000 people at Playland, the shore park of the Westchester County Park Commission, beside a growing resident population. This project and its plant were completed and placed in operation in April, 1928.

The Mamaroneck project serves as area of 26 square miles, with an assessed valuation of \$140,000,000, and an estimated present population of 35,000, and an estimated population of 400,000 in 1980. It will insure sanitary disposal of sewage from more than one-half the City of White Plains, three-quarters of the Town of Harrison, part of Scarsdale, most of the Town of Mamaroneck, and a small portion of the Village of Rye. Beside trunk sewers and treatment plant, the plans include a submarine outfall between 2 and 3 miles long, discharging the sterilized effluent into water some 50 feet deep and over a mile from shore. An unusual feature in connection with the construction of this 54-inch submarine outfall is the use of Victaulic joints in a submarine pipe of this length and great depth, marking this undertaking as far in advance of any of its kind. Mr. Young is also a pioneer in effectively handling and using under certain conditions, cast iron pipe coated with glass-like enamel of proven cast iron pipe coated with glass-like enamel of proved diameter, but ultimately of less effective carrying capacity. The work has been under active construction since February, 1928, and its completion is expected during the present year.

The Hutchinson project serves as area of 8.2 square miles, with an assessed valuation of \$220,000,000, and a present population of upward of 60,000, and an estimated population for 1980 of about three times this number. This project will take care of a large part of Mount Vernon, and parts of Scarsdale, Eastchester, New Rochelle and the Pelhams.

The South Yonkers project is located in the southwesterly part of the City of Yonkers and, while embracing an area of only 1.5 square miles, has a present population of about 40,000, with an estimated population of upwards of 100,000 for 1980; and a present assessed valuation of about \$100,000,000. The plans provide for trunk sewers and appurtenances to connect with the Bronx Valley Sewer near Mount Saint Vincent, on the Hudson.

The Saw Mill River project embraces an area of 27 square miles, with an assessed valuation of \$172,000,000, and a present population of 63,000. It is estimated that by 1980 the population on this project will amount to 500,000, and the assessed valuation will have multiplied about ten times. The project will serve the north central part of Yonkers and parts of Hastings, Irvington, Ardsley, Tarrytown, Elmsford, Greenburgh, Hawthorne, Thornwood, Mt. Pleasant, Pleasantville and Chappaqua. The project includes trunk sewers and a joint treatment plant for this project, the Bronx Valley and the North Yonkers projects.

The North Yonkers project embraces an area of more than 2.6 square miles, with an assessed valuation of \$75,000,000, and a present population of 20,000. It is estimated that by 1980 this project will serve property assessed at \$380,000,000, and a population of 140,000. The area includes the Hudson River slope at Dobbs Ferry and Hastings, and the northwesterly part of Yonkers.

The Upper Bronx Valley project embraces an area of 3.5 square miles in the Bronx Valley, north of the upper end of the Bronx Valley Sewer. It is in general situated north of White Plains. This district has a present assessed valuation of some \$15,000,000, and a population of about 4,000, and includes parts of the towns of Mount Pleasant, North Castle and Harrison, all of which have petitioned for its construction.

Mr. Young is assisted in his New York office by a staff, including Albert M. Brosius, Mem. Am. Soc. C. E., formerly Chief Engineer in charge of the construction of a \$15,000,000 sewer project for Havana, Cuba, and similar work at Baltimore, and with the J. G. White Co., in Central America; David J. Shaw, Assoc. Mem. Am. Soc. C. E., long in charge of work for the Board of Water Supply, New York, and until recently Vice President of the Shevlin Engineering Co.; George A. Sherron, Mem. Am. Soc. C. E., formerly City Engineer, Norwalk, Conn., Assistant to President, Fred F. French Co., and until recently Superintendent of Public Works, Port Chester, N. Y.; and J. W. Van Denburg, formerly with the New England Power Co., and the J. G. White Co., of New York.

William L. Rockwell, consulting engineer, 820 Cambridge Oval, San Antonio, Texas, is in charge of plans and supervision of construction for an irrigation and power project, which it is estimated will cost about \$6,600,000, for the Maverick County Water Control and Improvement District No. 1, as well as plans for a \$2,500,000 irrigation project for the Zavala County Water Improvement District No. 2.

Taylor Engaged on Water and Sewerage Projects

AT Scotia, N. Y., the existing water supply system is being materially improved under the supervision of HENRY W. TAYLOR, 11 Park Place, New York, by further development of the well area, the installation of a new pumping station and new pumping equipment. A new 16-inch force main, about 7,000 feet long, has just been completed to a high level storage reservoir of about 3,000,000 gallons capacity.



Henry W. Taylor

At Hamilton, N. Y., Mr. Taylor has practically completed the new sewer system and complete sewage disposal plant, although the disposal plant will not be put into operation until Spring. The disposal plant consists of settling tanks, separate sludge digestion tanks with floating covers, a glass covered sprinkling filter, final settling tanks and sludge beds.

The existing water works system at Oxford, N. Y., is being improved by the installation of duplicate main feeder lines and by the addition of covered storage reservoirs to increase the existing storage capacity.

At Granville, N. Y., new pumping apparatus is being installed and improvements laid out for the future.

Mr. Taylor recently completed a report on improvements to the water works system of Troy, Pa., and is supervising the installation of a small hydro-electric plant near Peekskill, N. Y., as well as acting as an expert in a damage suit resulting from the overflow of a storm water sewer at Port Chester, N. Y. He has also been retained as consulting engineer for the proposed water supply system for the village of Maybrook, N. Y.

At Saxton, Pa., he is working on minor improvements to the 600 lineal feet of automatic steel flashboards which were installed two years ago by his office, and has recently completed a power survey of five mills and reports on ways and means of reducing the kva. demand and general power costs at Lee, Mass.

A complete investigation for new intercepting sewers and sewage disposal plant for the City of Rome, N. Y., is also under way.

Plans for Sewerage and Water Projects

IN a recent report Julian Montgomery of MONTGOMERY, & WARD, consulting engineers, 545 Harvey-Sniders Bldg., Wichita Falls, Texas, states that his organization is at present preparing reports and plans on a water works project for Dimmitt, Texas; a paving program in Grand Saline, Texas; a sewerage system for Stanton, Texas; a water works plant and sewers for Levelland, Texas; a water development for Fredericksburg, Texas; a program of water works, sewers and pavement construction for Mineola and a system of sewers and paving for Hale Center, Texas.

Work now being done under the supervision of Montgomery & Ward includes a sanitary sewerage system for Midland, Texas, and paving for Midland, Littlefield and Brownfield, Texas.

Nuttall Opens Consulting Office in Philadelphia

ACONSULTING practice which will be purely municipal, particularly city planning and waste disposal, with special emphasis on incineration, has been started in Philadelphia by JOHN H. NUTTALL, 1322 Orthodox St., Philadelphia, Pa.

For 20 years Mr. Nuttall has been associated with the City of Philadelphia as surveyor, supervising engineer of the Permit Division and district engineer of the Bureau of Highways, as well as principal assistant engineer of the Bureau of Street Cleaning. Concurrent with the above, Mr. Nuttall was Secretary of the Board of Highway Supervisors of Philadelphia, and instructor in highway engineering at the Drexel Institute, Philadelphia.

His experience comprises general land and municipal surveying, city planning, design of municipal structures, design and supervision of road and street pavement construction and maintenance, supervision of street cleaning, refuse collection and disposal and snow removal. For the past seven years he has been engaged in waste collection and disposal, street cleaning and snow removal work. This includes general organization of the bureau on a technical basis, planning of routes, methods and facilities, supervision of general work of the bureau, design and construction of incinerators and other disposal facilities, as well as research work covering all phases of street cleaning, waste collection and disposal, and snow removal to obtain basic engineering data for practical application. Many of these studies have been published.

Mr. Nuttall is a registered professional engineer of the State of Pennsylvania, an Associate Member of the American Society of Civil Engineers, a member of the Society of Municipal Engineers, and a member of the Sub-Committee on Street Cleaning of the Committee on Maintenance of the American Road Builders Association.



John H. Nuttall

Senior Partner of B. M. Hall & Sons Passes Away

ANNOUNCEMENT has been received from B. M. HALL & SONS, Peters Bldg., Atlanta, Ga., of the death of its senior member, Benjamin Mortimer Hall, who spent more than fifty years in the active practice of his profession. He was graduated from the University of Georgia in 1876 with the degree of Bachelor of Engineering and later received from the same university the degree of Civil and Mining Engineer and the honorary degree of Doctor of Science. Mr. Hall's professional work was devoted largely to mines, quarries and hydraulic problems. He was a charter member of the Georgia Academy of Science, a member of the American Society of Civil Engineers and the American Institute of Mining and Metallurgical Engineers. The profession has lost a widely known and respected member in Mr. Hall's death.

Reichardt Preparing Plans on Sewers and Paving

PLANS are now being prepared for a comprehensive sewer plan for Watertown and for thirty blocks of paving at Columbus, Wis., by W. F. REICHARDT, consulting engineer, 109 Main St., Watertown, Wis., who is also in consultation with a western city regarding a new sewage disposal plant and sewerage system. Work which he is supervising at present includes the completion of sanitary sewers at Watertown, storm sewers at Columbus, Wis., water mains at Eagle River, Wis., and other small jobs.



Col. W. F. Reichardt

Interstate Commerce Commission Activities

THE engagements and retainers of HENRY J. SAUNDERS, 643 Transportation Bldg., Washington, D. C., are principally in connection with the preparation of Valuation Order 3, relating to carriers reports of additions and retirements; the representation of carriers as expert advisor and witness in recapture hearings; the representation of carriers as expert witness in consolidation proceedings and witness in rate cases. All of these activities require an intimate knowledge of Commission procedure and data used by it in its findings. Much of this experience was secured by Mr. Saunders in his 14 years with the Commission prior to 1928.

Beginning in 1914, the Interstate Commerce Commission made a valuation of the 250,000 miles of railroads in the United States. This work cost the Commission over \$35,000,000 and the carriers over \$100,000,000. The aggregate value of property found was over \$25,000,000,000. It was thus the most stupendous work of appraisal ever carried on in the history of the world.

The Interstate Commerce Commission necessarily made its valuations of individual properties as of different years, and it is now engaged in bringing these up to date by a process of repricing and adjusting for additions, retirements and betterments. The Commission is also undertaking to recapture the excess earnings of those carriers which are liable for such recapture under Section 15a of the Interstate Commerce Act.

Other phases of Commission work are the approval of proposed consolidations, the issuance of securities, and the rate cases.

Nearly the entire time of Mr. Saunders' organization is occupied with assisting railroads with their reports and acting as advisor, consultant and witness in hearings with respect to valuation, rates, recapture of earnings and related subjects before the Interstate Commerce Commission. Among the railroads represented by Mr. Saunders are the Rio Grande & Eagle Pass, Litchfield & Madison, Chicago, Attica & Southern, Lancaster & Chester, Bennettsville & Cheraw, Kelly's Creek, Morristown & Erie, Chesapeake Beach, Maryland & Dela-

ware Coast, Ashley, Drew & Northern and the Tooele Valley Railroad.

Bull & Roberts Specialize in Gasoline and Oil Analyses

THE members of the firm of BULL & ROBERTS, chemical experts, 50 West St., New York, while not engineers themselves, have for over 26 years served various engineering firms as chemical consultants and analysts and for this purpose place at the disposal of their clients years of diversified experience and a fully-equipped chemical and bacteriological laboratory. The firm at present consists of Alfred E. Roberts and Dr. Alvin C. Purdy, as partners. Irving C. Bull retired as a general partner on July 1, 1929, but remains as consultant to the firm.

Of interest to contractors and engineers having to do with the operation of truck fleets is the specially developed consulting service on the choice of gasoline and lubricating oils. Appreciating the need among fleet operators of something more than a mere analysis of samples of gasoline and oil, this firm has made every effort to correlate laboratory results with actual operation. As a result, they are following the operation of some three thousand cars, including such fleets as those of the Yellow Taxi Corp., the Surface Transportation Co., the Clemente Contracting Co., and others.

Cleveland Has Sewage and Water Projects Under Way

ONE of the projects planned and now being constructed under the supervision of H. BURDETT CLEVELAND, 225 Broadway, New York, is a sewage treatment plant for Red Bank, N. J. He also made the plans and is supervising the construction of the sewer extensions at Fieldston, New York City, and the sewage treatment plant and water supply improvements for the Loomis Sanatorium, Loomis, N. Y. A report is now being prepared in the office on a water supply valuation for Ocean Beach, plans are going forward for a sewage treatment plant and water supply for the J. C. R. S. Tuberculosis Sanatorium at Highland Mills and for a refuse incinerator for Red Bank, N. J.

This organization has been called upon for expert testimony in the Town of Woodstock, Orange County, N. Y., hospital site controversy, the Rockaway Beach, N. Y., condemnation case, and the Jamaica Water Supply Co. injunction case.

Arthur L. Reeder has recently joined Mr. Cleveland as Principal Assistant Engineer and George F. Parsons as Assistant Engineer.



Photo by Blank & Stoller
H. Burdett Cleveland



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The Editor Comments —

Cheerio!

As the second week of enforced idleness comes to a close, I realize that my monthly message is due. An inquisitive right index finger was rather forcibly whisked out of the way and messed up by the fan of my automobile, so I have been doing time with an infected finger. There are some compensations, perhaps the chief being the opportunity to become acquainted, via radio, with that remarkable personality, Cheerio. Ordinarily the broadcast hour from 8:30 to 9:00 is being used to make the final dash from train to office, but for these two weeks, I have been able to enjoy Cheerio. Far from being a sob sister or a Pollyanna philosophizing for females alone, he packs in a lot of good horse sense that even a hard-boiled editor can appreciate. Would that there were more like him!

Did You Get Lost at the Road Show?

Your first impression of the Atlantic City Auditorium last month was that it was really not much bigger than Cleveland's Municipal Auditorium, but when you started to walk, you soon realized that several Cleveland auditoriums could readily be set out on the main floor.

Because the aisles were not jammed as in the old days in Chicago, making human progress closely akin to that of a worm, some folks thought the attendance was small, but the official registration showed that again the A.R.B.A. Road Show broke all records.

I was mighty glad to have so many of my friends stop in at our booth and particularly those that I have met in the field. Shall we meet next year in Atlantic City, New Orleans or Houston, Texas?

Congress Peps Up 1930 Road Construction

On January 29, the Senate passed a bill appropriating \$300,000,000 to be expended on Federal Aid road construction in the next three years. This bill, endorsed by President Hoover and the American Federation of Labor, is bound to go a long way in stimulating any states which may have been at all backward in making proper allotment of funds for highway work. It will also bring cheer to contractors as much as the Cheerio Hour has brought to me these last two weeks. Incidentally, it is rumored that this Cheerio Hour is financed by President Hoover, himself. Thus, our Nation's President may be credited with two good three-base hits for his stimulators of good cheer among individuals and among contracting organizations.

Federal Aid per Mile Increased

The bill mentioned above, which has already passed the House, increases the amount of Federal Aid that may be used in road building from \$15,000 to \$25,000 per mile. This increase was brought about as a result of testimony before the Roads Committee of the House

which showed that \$15,000 a mile was not always ample for many of the projects involving Federal Aid.

Coming Events Are Doing Some Shadow-Casting

A rather remarkable series of articles is now in our files from contractors and engineers with whom we contacted last summer. Some of these jobs were only just materializing at the time so I couldn't cover them personally, but the right man on the job who could furnish you with helpful methods and facts was selected and now this group has produced the articles below which will appear in the March and April issues of CONTRACTORS AND ENGINEERS MONTHLY.

"Novel Construction to Keep Mud Out of Creek," by Charles V. Imeson, Consulting Engineer, Jacksonville, Fla. An interesting description of the struggle of a contractor versus mud in cleaning up and beautifying Hogan's Creek in Jacksonville.

"Unclassified Excavation, Utopia and Hades," by Harry R. Hayes, Engineering Secretary, N. Y. State Highway Chapter, A. G. C. of A. A discussion of the much-mooted subject of unclassified excavation which, although a necessary evil, should not be used as a subterfuge by engineers.

"Bulldozer Boosts Shovel and Truck Yardage on Bay State Concrete Job," by Kenneth W. Chase, Resident Engineer, Mass. State Dept. of Public Works. Helpful hints on the use of a bulldozer as employed on a resurfacing and railroad crossing elimination job at Lanesboro, Mass.

"Controlling Construction Costs," by L. M. Richardson, Manager of Construction, Morton C. Tuttle Co., Boston. Suggestions for methods of keeping cost data, progress and purchase schedules and time and labor statements and their importance to the contractor.

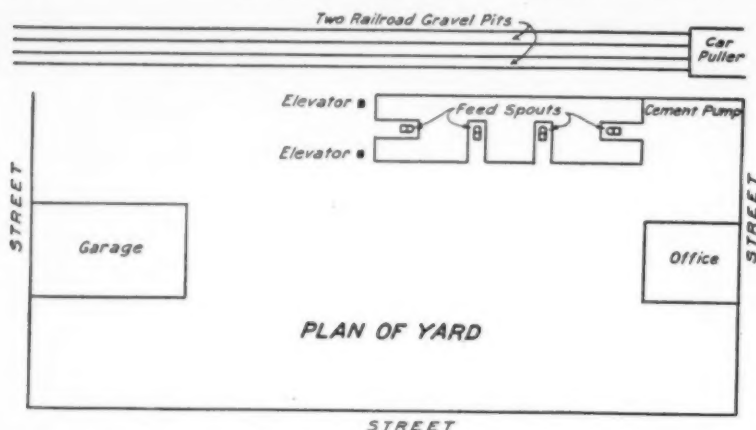
"Good Organization on 15-Mile Alabama Concrete Job," by S. E. Fitch, Resident Engineer, Ala. State Highway Dept. An interesting outline of how good organization makes for speedy operation and satisfactory results.

"Blasting on Highway Construction Projects," by H. M. Hamilton. Efficiency and economy in any operation lead to profits and ultimate dividends and in this article Mr. Hamilton points the way to that goal in the field of blasting.

Yours Truly

I have to smile when I think of the signature that is going to appear at the end of this page of rambling thoughts because it isn't much like the hybrid that would appear if I had to sign my name this minute. Done with my left hand it would look more like a 5-year-old's attempt guided by a 90-year-old palsied hand. Pardon, Cheerio, I should have said "90 years young."

Theodore Reed Kendall



An Efficient Ready-Mixed Concrete Business Developed by San Francisco Company

A WELL-PLANNED and well-laid-out plant and an efficient fleet of nineteen mixer trucks have been developed by the Golden Gate-Atlas Materials Co., San Francisco, Calif., one of the largest building materials companies in San Francisco, to carry on its transit system mixed concrete business which was started as a branch line only three years ago. The rapid advance of this business has demonstrated again that ready-mixed concrete can be delivered to the contractor at a saving and with a profit to the operating company.

The plant of this company, which is located at 16th and Harrison Streets, in San Francisco, occupies a block of property 400 feet long and 124 feet wide. One-half of this space is devoted to the bunkers, garage and office while the remaining portion has proved extremely valuable as a place to wash the fleet of trucks as the washings can not enter the city sewers because of the cement content. All trucks are washed out after each day's work.

The bunkers were built with four weighing scale hoppers and can serve four trucks at one time. Each weighing hopper is fed by four aggregate compartments and by a circular cement hopper with a conical bottom located in the central part of the aggregate compartments, the cement hopper forming the inside wall of the aggregate compartments. Each one of the four cement tanks holds 325 barrels of cement and these tanks are filled from bulk cement cars by a Fuller Kinyon pump. The weighing hoppers are circular steel with conical bottoms which have been found by this company more satisfactory than the square hoppers. As soon as the cement has been added to the dry aggregates, the batch is placed directly in the mixer, the water added and the concrete mixed en route to the job. The transit system of mixing concrete has been found most satisfactory by the Golden Gate-Atlas Materials Co., and has considerable advantage over the method of mixing at the job, because of the delay caused at the job and the tendency to rush the

mixing.

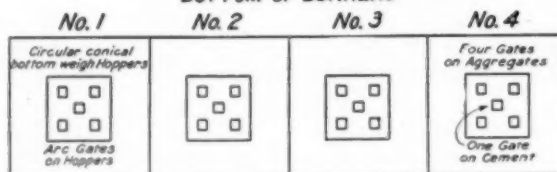
Perhaps the most important single factor in the success of this business is the fleet of sixteen Transit mixers and four Barrymore mixers mounted on White trucks. The Transit mixer used is 5½ feet in diameter and 8 feet long. The length of the cone is 3 feet and the diameter of the opening 1 foot 4 inches. The mixer is not equipped with a water tank as the water is added at the plant, although the company is contemplating equipping the trucks with a small tank so that the mixing can be done at the job if necessary. The aggregate, cement and water is weighed and measured into the mixer at the plant. The load is calculated to produce 4 yards of concrete in

place. The mixer is air-tight when the door is closed and considerable pressure is built up in the mixer as it revolves en route to the job. Engineers in San Francisco generally allow one hour from the time that the concrete is placed in the truck until it is emptied, provided that the truck is revolved a considerable portion of that time, but it is seldom necessary to wait an hour before dumping. The average mixing time from the batching bunkers to the job is 15 minutes.

The schedule of trucks is very important and two men are kept outside servicing the jobs, scheduling trucks, signing tags and generally expediting delivery of the concrete.

The largest yardage poured by this company was approximately 18,000 yards in 25 working days, all through one bunker. The transit mixers all averaged over 1,000 yards each per month and one mixer handled 1,400 yards. The principal officers of the Golden Gate-Atlas Materials Co., are Charles M. Cadman, President, and Carroll Stephens, General Manager.

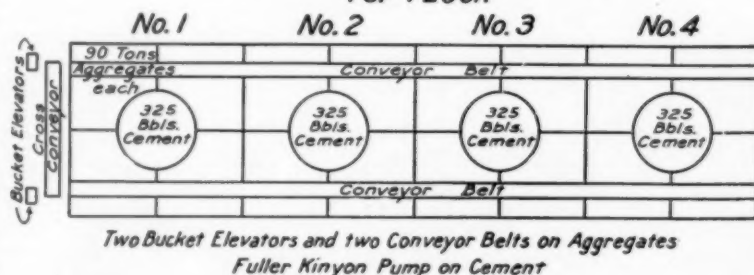
PLAN OF WEIGHING HOPPERS AND BOTTOM OF BUNKERS



An Unusual Record for Speedy Truck Loading

WHAT appears to be a record for speedy loading of trucks was attained by Clifford Morden, Superintendent of Yard No. 5, Calumet Coal Co., Chicago, Ill. During a period of 4½ hours one morning, with a 1-yard clamshell bucket and a Link-Belt crane, he loaded 196 trucks of sand and stone for the Hedges Construction Co. The crane dug into the pile and made a half-turn for each delivery into the adjacent hopper. The pace was maintained consistently, as the crane ran the entire job without stopping, filling the hoppers one after another and keeping ahead of the trucks that were being loaded from the hoppers.

PLAN OF LOADING BELTS AND BUNKERS TOP FLOOR



Who's Who in Construction

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- A—Over \$5,000,000
- B—Between \$1,000,000 and \$5,000,000
- C—Between \$500,000 and \$1,000,000
- D—Between \$250,000 and \$500,000
- E—Under \$250,000



Geo. W. Katterjohn, Sr.

George W. Katterjohn & Son, Paducah, Ky. Organized: 1920. Bus. vol. E. This business was conducted as George W. Katterjohn, Contractor, until 1920 when George W. Katterjohn, Jr., joined the firm and a partnership was formed. The type of work done consists of both general building and paving construction, specializing in heavy factory and industrial construction, school buildings and municipal sidewalks, curb, gutter and alley paving. Officers: George W. Katterjohn, Sr., and George W. Katterjohn, Jr., partners. Major contracts: sidewalks, curb and gutter contract with the city of Paducah, Ky., \$150,000; Augusta Tilghman High School and Gymnasium Buildings, Paducah, \$215,000; Metzger Meat Packing Plant, Paducah Ice Mfg. Co., Studebaker and Nash Garage, Paducah; sidewalk, curb and gutter contract, Mayfield, Ky., \$80,000; concrete bridge, Jackson, Tenn.; 20,000 square yards, concrete encasement to 1,500-foot sand fill approach to the Paducah-Ohio River Bridge located at Paducah, Ky.



Geo. W. Katterjohn, Jr.

W. E. Callahan Construction Co., Dallas, Tex., 708 Kirby Bldg. Branch offices: St. Louis, Mo.; Waco, Tex.; San Angelo, Tex.; Marseilles, Ill.; Warsaw, Ill. Organized: March 21, 1912. Bus. vol. B. This company succeeded Callahan Bros, a partnership. It was at first composed of W. E. Callahan, W. F. Callahan and A. J. Callahan, but in 1916 E. S. Heyser, of Dallas, Tex., purchased all stock not held by W. E. Callahan. In 1927 Mr. Heyser sold his stock to Paul Grafe, William McCormick and H. F. McFarland, Jr., who with W. E. Callahan are the present owners. Officers: W. E. Callahan, President; Paul Grafe and H. F. McFarland, Jr., Vice-Presidents; William McCormick, Secretary and Treasurer. Major contracts: 1927, dam and reservoir, Dallas, Tex., \$3,200,000; 1928, Section B2 and C, River des Peres, St. Louis, Mo., \$1,200,000; 1929, outfall sewer contract, Louisville, Ky., \$325,000; Hunt and Lima Lake Drainage Districts, Ill., \$344,000; under construction, Section E, River des Peres, St. Louis, Mo., \$871,000; dam and reservoir, Waco, Tex., \$771,000; pipe line and filtration plant, Waco, Tex., \$525,000; dam and reservoir, San Angelo, Tex., \$400,000; barge canal, Illinois River, Marseilles, Ill., \$797,000. Member: A. G. C., Dallas Rotary Club, Dallas Chamber of Commerce.

J. S. Sweitzer & Son, Inc., St. Paul, Minn., 761 Builders Exchange. Organized: August 1, 1926. Bus. vol. D. This

company was operated as a partnership from June 1, 1914 until August 1, 1926 when it was incorporated. Officers: J. S. Sweitzer, President; J. R. Sweitzer, Secretary and Treasurer. Major contracts: Preventorium Hospital; Wilder Nursery Hospital; store house, Minnesota State Fair; addition, Veterans Hospital; Red Wing, Minn., Post Office; cold storage plant, Swift & Co., Marshall, Minn. Members: St. Paul Builders Exchange; St. Paul Master Builders Assn.

Lee M. Biggs, Arkansas City, Kansas, 911 West Chestnut Ave. Officers: Lee M. Biggs, owner. Type of contracting: general.

H. K. Ferguson Co., Cleveland, Ohio, Hanna Bldg. Branch offices: New York, Chicago, Pittsburgh, Detroit, Birmingham and Tokyo. Organized: August, 1918. Bus. vol. A. Officers: Harold K. Ferguson, President and Treasurer; R. E. J. Summers, Vice President and Contract Manager; J. S. Ruble, Vice President and Construction Manager; H. S. Jacoby, Secretary and Chief Engineer. Major contracts: Procter & Gamble Co., St. Louis and Staten Island plants; Selby Shoe Co., Portsmouth, Ohio; Westvaco Chlorine Products, Inc., South Charleston, W. Va.; Nippon Electric Co., Tokyo, Japan; Tokyo Electric Co., Tokyo, Japan; Ford Motor Co., Yokohama, Japan; Corn Products Refining Co., Korea; American Enka Corp., Asheville, N. C.; Western Electric Co., Baltimore, Md.; Carbide & Carbon Chemical Corp., Niagara Falls, N. Y.



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3. R. E. J. Summers, Vice Pres. and Contract Mgr.
4. H. S. Jacoby, Secy. and Chief Engr.

Legal Points for Contractors

These brief abstracts of court decisions in the contracting field may aid you in avoiding legal difficulties. Local ordinances or state laws may alter the conditions in your community. If in doubt consult your own attorney

Edited by A. L. H. Street, Attorney-at-Law

Claim of Ownership of Gravel Held to Be Asserted Too Late

Often legal rights are lost through failure to assert them at a proper time. The courts say that when a party has failed to speak when he should, he will not be permitted to do so when he would. These cases arise under what is known as the law of Estoppel.

An illustration is afforded in the case of Norman vs. Summerfield-Jones Construction Co., 18 S. W. 2d, 559, disposed of by the Springfield, Mo., Court of Appeals July 1, 1929.

Plaintiff sued for the value of gravel taken from land he claimed to own, without his permission. The court found that he did not own the property, but held that even if he had he could not claim pay for the gravel because he waited too long before he asserted ownership of the land. From start to finish, plaintiff knew that the gravel was being hauled away, but he made no claim until defendant was through. Under these circumstances, the court said:

"It occurs to us that, when plaintiff saw defendant removing the gravel, he ought to have understood that defendant must have secured permission from some one to remove the gravel, and common honesty and fairness ought to have prompted him to let defendant know that he claimed to own the gravel, but this he did not do. He should have assumed that defendant was acting in good faith, and should have at least inquired by what authority he was removing the gravel, and asserted his own ownership of the same. Of course, if defendant were, in fact, willfully trespassing, there would be no obligation on the part of plaintiff to speak and give notice of his claim; but, in the absence of knowledge on the part of plaintiff of any fact, except the mere fact that defendant was removing gravel from premises claimed by plaintiff, he should not have assumed that defendant was a willful trespasser, but should have assumed that defendant was honest, and would not remove the gravel from any place without first securing authority from some one whom he believed to be the owner, and should have immediately notified defendant of his claim to the ownership of the gravel."

Purchase by Contractor's Agent Held Not Binding on Contractor

An unsuccessful attempt to hold a contractor liable for a purchase of pipe made by an agent on his own credit was involved in the case of Georgia Paving & Construction Co. vs. Morgan, 149 S. E. 426, decided September 9, 1929, by the Georgia Court of Appeals. It appeared from the facts of the case that the agent of the contractor had supervisory authority over construction work, but had not been empowered to purchase materials, excepting out of cash advanced to him for the express purpose.

However, the opinion recognizes that the undisclosed principal of an agent may be held liable for acts and contracts of the agent, where the latter acts within the scope of actual authority given him.

The court also decided that "A person having authority from another to use the other's name in making cash purchases for the latter has no authority to make purchases and pledge his principal's credit for their payment."

Method of Proving Contractor's Accounts

Ordinarily, the contractor is interested only in the branch of the law that will show him how to *keep out* of litigation. He must trust to local counsel to *get him out* of litigation after he is once in. So, usually, it is not worth while for the contractor to concern himself with the intricacies of court procedure.

But he should know something about the law of proving accounts, so that he may intelligently preserve legal evidence of his business transactions, against the possibility of future litigation. Thus is he justified in learning the substance of the decision handed down by the Arkansas Supreme Court March 4, 1929, in the case of Lynch vs. Stephens, 14 S. W. 2d, 257.

That was a case in which a subcontractor sued for compensation under a highway construction contract. The following is the substance of some of the points decided by the court:

A book-keeper's statement of expenses, etc., connected with a job is not legal evidence of the things stated in it, although it be sworn to before a notary public. (The principal ground on which this rule of law rests is that the person making the affidavit is not subject to cross-examination on the matters stated by him.)

Where it appears that a book-keeper, engineer, or some one else, is able to give direct testimony on an important point, failure of the party having the burden of proof on that point to call him as a witness or explain why he is not called, raises a legal presumption that the witness, if called, would have given adverse testimony.

In Time of Peace Guard Against War

Every contractor in entering into an undertaking should expect the unexpected. He should foresee that there may be solid rock where he expects to find dirt or sand only. He should consider the possibility of labor or materials, or both, mounting sky-high before his contract is performed.

Had contractors for levee work in Mississippi observed this precaution on a big job they would have probably guarded against a heavy loss, which they later ineffectually attempted to guard against.

In this case (R. T. Clark & Co. vs. Miller, 122 So. 475, decided by the Mississippi Supreme Court May 20, 1929) it appeared that war conditions greatly increased the cost of performing the contract and the contractors induced the levee board to agree to increase the contract compensation 50 per cent. But the court held that the excess above the contract price must be paid back, because it was beyond the power of the board to allow more than the agreed compensation.

After referring to the fact that the contract was entered into after the World War had started and while entry of the United States was imminent, the court said:

"The contract involved contained no stipulation excusing performance because of conditions brought about by the war; and now such a condition will not be implied by the courts."

But while judgment was awarded against the contractors for return of the excess they received above the contract price, it was held that the contractors' surety was not liable, because sureties do not insure against the making of improper payments to contractors.

Contractor Held Liable for Damage to Third Party's Property Not Contemplated by the Contract

In the case of *Northwestern Pacific Railroad Co. vs. Currie*, 279 Pac. 1057, finally disposed of by the California District Court of Appeal August 29, 1929, a county highway contractor was found to be liable for injuring a railway right of way fence in constructing the highway. The court laid down this broad rule of law distinguishing the liability of the county in such cases from the liability of the contractor:

"Where a county contracts for the doing of construction work according to plans and specifications theretofore adopted, and the contractor performs the work with proper care and skill, and in conformity with the plans and specifications, but the work thus planned and specified results in an injury to adjacent property, the liability, if any there is, for the payment of damages, is upon the county under its obligation to compensate the damages resulting from the exercise of its governmental power. . . . but, where the contractor departs from the contract, plans, or specifications, or goes beyond them, or performs the work planned and specified in an improper, careless, or negligent manner, which results in injury to adjacent property, then he is responsible in damages for the tort [wrong] he has committed."

Contract for Delivery of Bonds to City Contractor Below Par Basis Held Void

A city's charter prohibited sale of its street improvement bonds below par, but permitted them to be delivered to the improvement contractor in payment for the work at not less than their par value. A contractor filed a bid offering to pave sidewalks at a lower price for cash than for payment in bonds. The bid was accepted on the latter basis, but in the case of *Bower vs. City of Bainbridge*, 148 S. E. 517, finally disposed of June 13, 1929, the Georgia Supreme Court held that the contract was invalid as violating the charter provision above mentioned. Said the court:

"The city, being able to have this work done for \$1.29 per square yard for cash, accepted the alternate bid of the contractor to make these improvements for \$1.65 per square yard in bonds. Here we have an indirect but clear violation of the provision of the charter which prohibits the sale or delivery of these bonds to the contractor at less than par. It would be foolish to hold that the city, while it could have the work done for \$1.29 per square yard for cash, did not deliver these bonds for less than par in payment of this work at \$1.65 per square yard. It is a familiar principle of law that a thing cannot be done by indirection which cannot be done directly. Under this contract the city was attempting to do by indirection what it could not do directly. When the municipality could have had this work done for \$1.29 per square yard for cash, for it to agree to pay for such work at \$1.65 per square yard in bonds was a mere bald evasion of the law. For this reason we cannot sanction the transaction."

Contractor's Liability on Account of Blasting

A decision handed down February 22, 1929, by the Kentucky Court of Appeals reaffirms the proposition of law that a contractor is liable for damage directly done to adjacent property by flying rocks, etc., in the process of blasting, although there may have been no negligence in the manner in which the blasting was done and although the contractor may have been doing public work, such as laying a sewer for a city. (*Campbell vs. Adams*, 14 S. W. 2d, 418.)

But the court also holds that where there is no such direct injury, and the adjacent property claims some such indirect cause of injury as concussion of the atmosphere, resulting from blasting, then there can be no recovery of damages without proof of negligence.

The claim in this case was dismissed, because there was no proof of direct injury and no proof of negligence causing indirect injury complained of, weakening of the foundations of plaintiff's buildings, etc., by reason of concussion.

Validity of Verbal Agreements

The law gives no legal effect to a "gentlemen's agreement." If a contract be such that under legal principles it must be in writing to be enforceable, moral obligations to conform to an oral agreement are as devoid of legal substance as a whiff of smoke from a pipe.

And when a construction contract reduced to writing purports to state the full agreement of the parties, all previous oral agreements are merged into the written contract, and it is not open to either party to show an oral agreement on some point that contradicts or enlarges the agreement in writing. An exception to this rule permits either party to show that, through fraud of the other party or through mutual mistake, the written contract fails to state the true agreement.

But it is not every expression of an agreement in writing that is to be taken as such complete written contract as to prevent either party from showing some additional terms, agreed upon by word of mouth, even though there is no mutual mistake or fraud in the writing.

To illustrate, in an opinion handed down March 12, 1929, in the case of *American Bridge Co. vs. Crawford*, 31 Fed. 2d, 708, the United States Circuit Court of Appeals, Third Circuit, decided that where the real agreement for steel construction on a building was oral, and letters subsequently passing between the parties were merely confirmatory of an oral agreement already concluded and did not purport to be the principal contract, there was nothing to prevent one of the parties from insisting upon a point of the oral agreement not covered in the letters. Said the court:

"If those letters contain the entire agreement, the evidence purporting to add other facts and covenants, or varying the terms of the contract, should not have been admitted. . . .

"They do not purport to be the formal agreement itself, but only a confirmation of it. Neither do they in terms purport to over the entire agreement. . . . Where there is a direct reference in a writing not purporting to be the agreement itself, as here, the agreement may be proved through the effect of such proof as to add material terms and conditions to the contract evidenced by the writing."

Kansas Workmen's Compensation Act

Under the terms of the Kansas Workmen's Compensation Act, an employee of a subcontractor has no claim against the general contractor for injury sustained in the course of employment by the subcontractor, holds the Kansas Supreme Court in an opinion filed April 6, 1929, in the case of *Leebolt vs. Leeper*, 275 Pac. 1087.

Contractor Held Not Liable for Accident Due to Removal of Warning Barrier, In Absence of Negligence

A fatal accident resulted on account of an excavation made by a contracting company in installing culverts on a highway, and judgment was awarded against the company. But in the case of *Pratt vs. Western Bridge & Construction Co.*, 226 N. W. 324, the Nebraska Supreme Court decided (July 5, 1929) that a new trial should be awarded because the jury had not been correctly instructed as to the law of the case. The Supreme Court laid down the following rule of law as governing such cases:

"Where a person charged with the duty of warning the traveling public of a defective or unsafe condition of a highway or bridge places or erects suitable barriers at or near the place where the dangerous condition exists, and after the erection thereof such barriers, through no act of the party erecting the same, become destroyed or knocked down, the party upon whom is cast the duty of erecting such barriers will not be liable to the person injured, unless it appears that he had actual knowledge of the destruction of such barriers, or that the same had been down for a sufficient length of time that a person in the exercise of ordinary care should have discovered their destruction."

Construction Industry News

Standard Oil Co. of Indiana, Chicago, Ill., has announced the appointment of D. E. Boismenue as Assistant Manager of the Asphalt Department. Mr. Boismenue has had considerable experience in the field of roofing asphalts and until his recent appointment has been the company's expert on roofing and specialty asphalts.



D. E. Boismenue, Asst. Mgr., Asphalt Dept., Standard Oil Co. of Ind., Chicago, Ill.

Gardner-Denver Co., Denver, Colo., has announced a number of recent changes in its personnel. T. H. Driscoll of its Chicago office has been transferred to the Los Angeles branch. Fred V. Moore, who has been covering the Eastern states, has been transferred to Phoenix, Ariz. R. J. Featherstone has been assigned to the New York office where he will handle the rock drill division products. Ian Duncan, Edinburgh, Scotland, after a preliminary training in the American plants of the Gardner-Denver Co., will represent the entire line in the London office of Gardner-Denver Co., Ltd.

Taft-Peirce Manufacturing Co., Woonsocket, R. I., has announced the recent appointment of Hal W. Reynolds as Direct Factory Representative for the company in the Cleveland territory. Mr. Reynolds' office will be located at 1724 St. Clair Ave., Cleveland, Ohio, where he will carry a representative stock of Taft-Peirce products. His territory will include the northeastern part of the state of Ohio.

Jos. F. Kiesler Co., 938 West Huron St., Chicago, Ill., has announced the appointment of F. W. Cherry as Sales Manager. Mr. Cherry was formerly District Sales Manager for the Universal Crane Co., Chicago.

Foote Co., Inc., Nunda, N. Y., has announced the appointment of the Hubbard-Floyd Co., Inc., 167th St. and Sedgwick Ave., New York, as its representative for the territory in Connecticut, New York and New Jersey adjacent to New York City. This territory was formerly handled by Frank E. Hall, whose recent death made this change necessary. The Hubbard-Floyd Co., has a large modern warehouse and shop in connection with its offices and will carry a stock of parts for MultiFoote pavers in order to give prompt and efficient service to customers in the New York territory.

Young Radiator Co., Racine, Wis., has announced the appointment of George H. Palm as Engineer in charge of radiator construction and equipment. Mr. Palm has had considerable experience in the engineering and development of motor coaches, bus chassis and accessories and for the past six years has been associated with the new development division of the Yellow Coach & Mfg. Co., division of General Motors, Pontiac, Mich.

Universal Atlas Cement Co., a subsidiary of the United States Steel Corp., has been formed to carry on the business of the Atlas Portland Cement Co., and the Universal Portland Cement Co. The new company assumes all the obligations of the Atlas and Universal companies. The combined productive capacity and sales territory will make the cement of the joined companies more readily available to an increased number of cement users. The plants of the Universal Atlas Cement Co., are located at Hudson, N. Y., Northampton, Pa., Universal, Pa., Buffington, Ind., Duluth, Minn., Hannibal, Mo., Independence, Kans., Leeds, Ala., and Waco, Texas. The offices of the company are in Chicago, New York, Philadelphia, Boston, Albany, Pittsburgh, Cleveland, Columbus, Minneapolis, Duluth, St. Louis, Kansas City, Des Moines, Omaha, Oklahoma City, Birmingham and Waco.

McEverlast, Inc., 111 West Seventh St., Los Angeles, Calif., announces the appointment of O. A. Steller as Manager of the Advertising Department. For several years Mr. Steller has been Editor of "Concrete," an engineering publication with an international circulation, and, previous to this connection, he served in the Advertising and Publications Bureau of the Portland Cement Association, Chicago. Mr. Steller has traveled extensively and has been employed on the engineering staffs of the Wisconsin Highway Commission, in several railroads and the U. S. Geological Survey.

The American Rolling Mill Co., Middletown, Ohio, has announced that E. N. Millan, Chief of Construction, has recently been made Chief Engineer of the company. Before joining Armeo in 1916, Mr. Millan was with the Cameragraph Co. of Kansas City and the Omaha Structural Steel Co., as an engineer. In 1920, he was made Assistant Engineer of Armeo and transferred to the Ashland, Ky., plant in 1923 as Engineer in the Construction Department. In June, 1924, he was made Chief of the Construction Department.

O. K. Clutch & Machinery Co., Columbia, Pa., has opened a Chicago office located at 53 West Jackson Blvd., Chicago, Ill. S. O. Nafziger is in charge.

Allis-Chalmers Mfg. Co., Milwaukee, Wis., has recently appointed the Motor Power Equipment Co., St. Paul, Minn., distributor of wheel tractors and farm implements, including Allis-Chalmers 20-35 and Allis-Chalmers United tractors as well as a full line of industrial equipment for the United tractor. The company's territory includes North and South Dakota, Montana, Minnesota, Western Wisconsin and Northeastern Wyoming. Branches are maintained at Fargo, N. D.; Sioux Falls, S. D.; Great Falls, Billings and Lewistown, Mont.; and Dickinson, Minot and Williston, N. D., where stocks of equipment and repair parts are carried. A. W. Logan, Vice President and General Manager, is in charge of the business.

The Haynes Stellite Co., unit of Union Carbide and Carbon Corp., 205 East 42nd St., New York, N. Y., has announced that at a recent Directors' Meeting of the company, E. E. LeVan was appointed General Sales Manager and J. H. Maguire was appointed Works Manager. Other appointments were F. T. McCurdy, Plant Superintendent, J. R. Brown, F. L. Second and Everett Page, Assistants to Superintendent and L. H. Brown, Research Engineer.

Gramm Motors, Inc., Delphos, Ohio, has announced the removal of its sales office from Toledo to Delphos, where the administration offices have been enlarged to take care of this change. A dealership has been organized at Toledo to take care of that territory.



The Mead-Morrison Giant Half-Yard Shovel

A Convertible 1/2-Yard Shovel

THE Giant Half-Yard shovel, among the features of which are the 3/4-yard dipper, live boom, automatic brakes, 3-drum control, long reach, cable crowd and full circle swing, is manufactured by the Mead-Morrison Manufacturing Co., 125 Prescott St., Boston, Mass. This shovel, which may be converted into a ditcher, clamshell, skimmer or drag-line, is built light where the stress is light and sturdy where the stress is heavy to make for balance, speedy movement and control.

The Giant Half-Yard has three drums instead of two, to make for fast, easy and flexible control of digging in all classes of work. Foot applied brakes have been eliminated, leaving the operator free to govern the swinging pedals with his feet. The drums are furnished with automatic brakes which grip the load automatically and safely. This automatic brake on the cable drum is a simple dead-ended lever operated band brake, set against backward rotation and sustaining the load at all times.

The boom of this shovel is 17 feet 3 inches long, and is made of built-up double box section, heavily riveted and reinforced to carry the strain of the cable crowd sheaves. Hinged on a 2 1/4-inch shaft 2 feet 11 inches long, the boom has a hoist range which allows it to be raised almost perpendicular and enables the operator to jack the crawler up with the crowd if necessary. The length of the hinge shaft stabilizes the shovel attachment and allows cleaning of the bank with the side of the dipper. The boom and crowd allow the dipper to be drawn up to within 1 foot of the crawler base, giving a large digging area without moving the machine.

Full 58 horsepower may be applied, jointly or separately according to digging conditions, to the crowd and hoist drums which are fitted with automatic brakes and controlled by long, easy-swinging levers. The cable crowd exerts a 15,500-pound pressure on the heavy dipper sticks, and the weight of the heavy live boom may be added when necessary. The crowd is reeved with two-part cable, which passes over sheaves at both ends of the armored double dipper sticks, and one of these sheaves is arranged with adjusting bolts for tightening the crowd rope.

There are no drive chains or sprockets, no pinion or rack, on the boom. The crowd thrust is applied directly and evenly at both ends of the dipper sticks, which are made for the most difficult digging, having hard oak centers armored on all four sides with heavy steel plate welded at the seams and fastened together at both ends by thick steel castings, which allow extra large sheave-bearing surface.

The Giant Half-Yard has a swinging speed of 5 1/4 revolutions per minute. A shift lever throws the swinging gear into mesh, and swinging is effected by the two foot pedals which control right and left turning. The rotating cab has a short

tail swing radius of only 8 feet 1 inch to facilitate working in limited space. Its low overall height allows its use in tunnels and buildings. The swinging cab is carried on five bronze-bushed, conical, steel turntable rollers, three in front where the digging pressure comes and two in the rear. The turntable which carries the hoist, cab and boom units is a single annealed steel casting.

The travel unit is simply and heavily built and is adequately protected from mud, stones and foreign objects. The 18-inch wide track shoes have a ground pressure of only 11.1 pounds per square inch, and the crawler travels 3/4-mile an hour and climbs a 30 per cent grade.

A New Dirt-Handling Unit

A NEW unit, known as the Dumptor, has recently been added to the line of excavating and material-handling equipment manufactured by the Koehring Division of the National Equipment Corp., Milwaukee, Wis. With full multiplane traction for mobility and easy handling over almost any kind of ground, with the ruggedness and drawbar power of a tractor and the bulldozing advantages of the dump body in discharge position, this Dumptor is a heavy duty unit combining the dirt-handling features of a truck, tractor and bulldozer.

One of the features in the design of the Dumptor is the power plant, consisting of twin 4-cylinder engines, which provide a continuous flow of power to the multiplanes for traveling in most varieties of ground conditions without steering clutches. This simplicity of design makes throttle steering possible and the operator merely opens or closes either motor throttle, depending on the direction in which he wishes to turn. In addition to easy handling, the twin motors design makes for fast operation, flexibility and more power when needed for heavy going.

The body, which dumps from the front end, has a width of 86 inches, a length of 129 1/2 inches and a struck level capacity of 5 yards, although its actual operating capacity is 6 1/2 yards. When tipped to dumping position by the hydraulic hoist, the wide body may be used as a powerful bulldozing blade.

Other features of the Dumptor are its low height of 59 inches and its low bearing pressure of 9.8 pounds per square inch with an 8-ton load. The low height permits easy clearance for a conveyor belt as well as for shovel, crane or drag-line loading. The Dumptor has four speeds forward, 1, 2, 3 1/4 and 5 1/4 miles per hour and one reverse, 1 1/4 miles per hour, and can turn in its own length.



The New Koehring Dumptor

A Pick-Up Conveyor

A COMBINED bucket elevator and belt conveyor for use in loading stone, gravel, cinders and similar materials from ground to trucks has been developed by the Conveying Weigher Co., 90 West St., New York. This machine has only seven buckets which pick up the material and discharge it into a trough belt conveyor with skirt boards lined with a tough rubber belt 18 inches wide and which may be from 18 to 30 feet long. The buckets are 20 inches long, 6½ inches wide and 6½ inches deep and are made of malleable iron with manganese steel teeth.

The conveyor frame carrying the belt is built of angles and plates. The belt runs loaded on troughing idlers above a steel plate and returns under the top of the frame. The steel plate on top of the frame protects the return belt from any gritty material and the lower plate protects the sprocket drive below. The belt is protected for its entire length by skirt boards and is carried on idlers spaced 2 feet apart at the bottom where the load is dumped and 3 feet 6 inches center to center for the remainder of the distance. The idlers are standard Conveying Weigher ball-bearing idlers with Alemite lubrication. There is a take-up of 6 inches for the belt and a take-up of 4 inches for any stretching in the bucket chain.

Power for driving the pick-up conveyor is furnished by an 8-horsepower Novo Roller gas engine or a 7½-horsepower electric motor. The engine operates at 1,200 rpm and is back geared at the engine to 600 rpm and power is delivered to various parts of the machine by manganese steel chains with 1-inch pitch bushed rollers measuring ¾ x ¾ inches. All chains are covered with sheet metal as protection against the weather and for safety.

Power is applied to the buckets and belt by a friction clutch and to the 3-foot, 6-inch drive wheel through an automobile gear shift, giving a backing speed of 8 feet per minute, and forward speeds of 12 and 16 feet per minute. The two Electric Wheel Co. steel wheels made with turned hubs run loose on the shaft and have pawls so that one wheel may be

connected and the other run loose, making it possible to turn the machine on one wheel as a pivot. The digging end of the machine is carried on a hollow roller wheel which is used to steer the machine by changing the position of one end of the axle by means of a rack and pinion. The drive to the cleated wheels is by chains over a large sprocket. The machine weighs approximately 4,000 pounds.



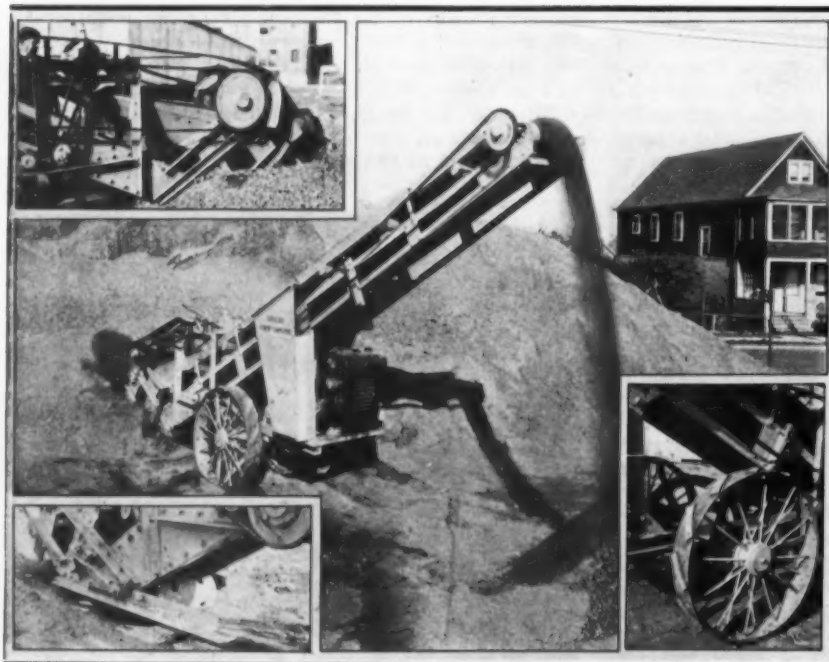
The Ramsay Guard-Rail

A Strong and Resilient Safety Guard-Rail

THE Ramsay guard-rail which is strong, being constructed of iron and concrete, and at the same time resilient is manufactured by the Chain Belt Co., Milwaukee, Wis. This safety guard-rail meets the impact of a collision with a cushioning action that absorbs the shock and stops the car, thereby minimizing the possibility of injury to the passengers and damage to the car and the rail.

The guard-rail supports are of malleable iron, stoutly mounted on concrete piers. The support consists of a base upon which two vertical struts are pivotally mounted. These struts support equalizers, also pivotally mounted, which carry the steel cables. Heavy steel springs at the rear of the strut base maintain the rail supports in their normal vertical position. These springs yield to the impact of a collision, permitting the cables and equalizers to be displaced through a lateral distance of 6 inches. These piers in which the rails are mounted may be easily and inexpensively cast in place by the use of a portable mixer.

The forces of impact are guided through the equalizers to the vertical struts, downward into the compression springs in the bases and thence through the piers to the earth. In this way possibility of injury and damage is reduced to a minimum.



THE NEW CONWEIGH PICK-UP CONVEYOR AND DETAILS

Upper left, the buckets digging in. Lower left, the roller used to steer the machine. Right, the steel wheels and the large drive sprocket.

*The Bishop Contact Cable*

New Contact Cable Which Acts as Continuous Switch

THE Bishop contact cable, which makes possible near and remote machine control through an unusual electrical mechanism, has been developed by the Bishop Wire & Cable Corp., 420 Lexington Ave., New York. The device consists of a waterproof, dustproof and acid proof cable about the size of an ordinary lead pencil, which when compressed at any point in its entire length, throws a switch, turns on a light, sounds a signal or does a variety of other things which ordinarily require direct contact with a button or switch at a given stationary point. In other words, the cable is a continuous switch, regardless of length.

The cable has a novel type of construction. Two conductors, enclosed by the outside insulation, are left bare but separated from each other by an isolating cushion of rubber. When pressure is applied this isolating cushion yields and permits the outer conductor to contact with a wire which in turn is always in contact with the inner conductor, thus closing the circuit. When pressure is relieved the isolating cushion returns the outer conductor to its normal position. Used with a relay switch, this cable becomes operative at the point of pressure, wherever the operator is standing.

The uses of such a cable are many but it is of particular interest to contractors for use in signalling work, emergency signals and the control of equipment.

Beam Hangers and Spreaders for Steel Construction

BEAM hangers and spreaders, known as Sure-Grip, are manufactured by the Dayton Sure Grip & Shore Co., Dayton, Ohio. These hangers are made of certified malleable iron, cored to take a $\frac{3}{8}$ or $\frac{7}{16}$ -inch bolt, and will carry a 5,000-pound load. The spreaders, designed to meet fireproofing requirements, are made of cold rolled strip steel. They are made in $1\frac{1}{2}$, 2 and 3-inch lengths and fit snugly over the casting.

In the erection of the Sure-Grip hangers and spreaders, a $\frac{1}{2}$ -inch hole is drilled in the beam bottom and the beam bottom batten the exact width of the I-beam plus $\frac{1}{2}$ -inch on either side. The hanger is then assembled in the batten

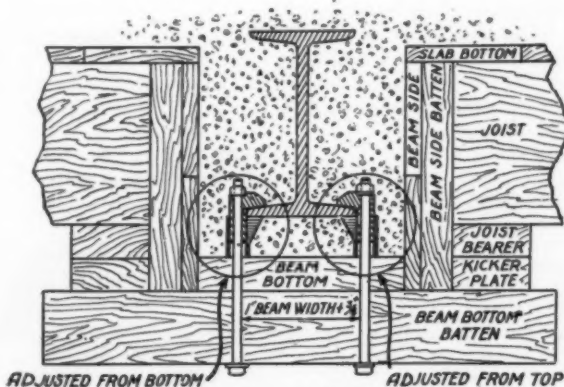


Diagram Showing Method of Erection of the Sure-Grip Beam Hanger and Spreader

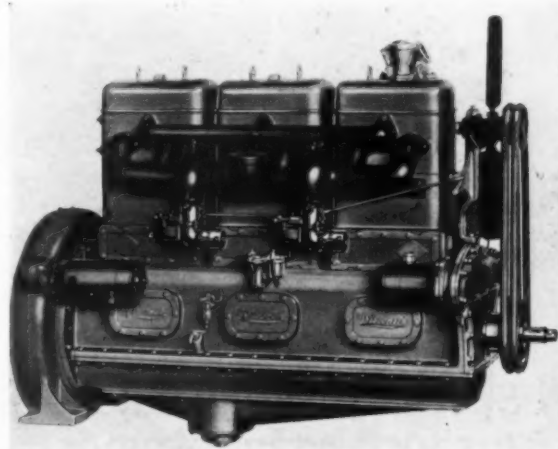
and bottom. The beam bottom is raised to the desired position with ropes, the hanger turned over the flange with the spreader under the flange on both sides of the I-beam. The nuts are then tightened until the beam bottom becomes perfectly rigid.

In wrecking, all that is necessary is to unscrew the bolts and remove the beam and slab forms. The bolt holes can be pointed up if necessary, or used in installing plumbing, or for some other purpose.

The use of these hangers eliminates the necessity of shoring for either beam or slab forms. It also makes possible forming two or three floors at once without the necessity of pouring concrete on the floor below. This means a saving of time and labor.

A New Series of Industrial Engines

A NEW series of engines of the valve-in-head type, specially designed for the needs of the industrial field and ranging in power from 100 to 125 horsepower at 1,000 rpm, has recently been developed by the Wisconsin Motor Co., Milwaukee, Wis.

*One of the New D-Series Wisconsin Engines*

There are three engines in this series, all 6-cylinder, and designated as D-2, D-3 and D-4. These three types are interchangeable, the difference being in the size of the cylinders, pistons and rings. D-2 has a $5\frac{1}{4}$ -inch bore, a $6\frac{1}{2}$ -inch stroke, a piston displacement of 844 cubic inches, develops 103 horsepower and weighs 2,650 pounds. The next engine in the series, D-3, has a $5\frac{1}{2}$ -inch bore, a $6\frac{1}{2}$ -inch stroke, 927-cubic inch piston displacement, develops 113 horsepower and weighs 2,675 pounds. D-4, the largest of the series, has a $5\frac{3}{4}$ -inch bore, a $6\frac{1}{2}$ -inch stroke, a piston displacement of 1,013 cubic inches, 125 horsepower and a weight of 2,700 pounds.

All main and camshaft bearings on these engines are bronze back, Babbitt-lined. The connecting rod bearings are die cast directly into the rod. The cylinders, cast in pairs, and the detachable cylinder heads and cylinders are of nickel chrome iron. The cylinder head covers, oil pan, front gear cover and pistons are made of cast iron while the crankshaft is of 45 per cent carbon steel, the connecting rods of 35 per cent carbon steel and the valves of chrome silicon steel.

Cooling is effected by means of a centrifugal pump made of cast iron with a bronze impeller. All parts of the cylinder, cylinder head, valve passages and spark plug bosses are cooled by water circulation.

The lubrication is by force-feed throughout. The oil is forced through a drilled crankshaft to all bearings by means of a gear pump. An oil lead is connected with the hollow

rocker lever shafts, thereby supplying positive lubrication to all rocker levers.

The magneto is mounted on a bracket on the left side of the engine, and this bracket is adapted to any make of magneto. The rotation of the magneto is clockwise and is driven off the rear end of the water pump shaft.

The electric starter has the standard flange mounting, with clockwise rotation viewed from the pinion end. The starting motor is mounted on the bell housing at the right side of the motor. The generator also has a standard flange mounting, and a ratio of $1\frac{1}{2}$ times the engine speed. It is mounted at the forward right side of the engine and is driven directly off the camshaft gear. Provision is made for mounting a Kingston governor on the forward left side of the engine.

If desired, these engines may also be equipped with an oil filter and fuel pump.



The Cletrac Swamp Special

A Specially Designed Tractor for Use in Swamps

A NEW and specially designed tractor, known as the Cletrac Swamp Special, has been developed by the Cleveland Tractor Co., 19300 Euclid Ave., Cleveland, Ohio, for use in marshes, swamps and similar tracts where ordinary power units could not travel.

In general design, this Model 30 Swamp Special is the same as the standard Model 30 Cletrac. The difference in design is found in the provisions made for the installation of the wide tracks with which the Swamp Special is equipped. The track shoes with grouters attached are 22 inches in width, and the length of each track on the ground is 73 inches making a total tractive surface of 3,080 inches. As a result the ground pressure is reduced to the very low minimum of 2.6 pounds per square inch. The Cletrac system of lubrication affords instantaneous and thorough oiling from the driver's seat.

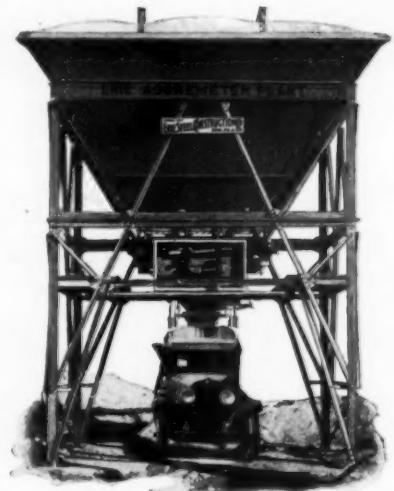
A New Portable Batcher Plant for Loading Mixer Trucks

A NEW type of AggreMeter plant for loading the various kinds of mixer trucks has been developed by the Erie Steel Construction Co., Erie, Pa. These new plants are built in 2, 3 or more compartments of 25-ton capacity and up, for loading $\frac{1}{2}$ to 3-cubic yard trucks.

The design of the entire unit is simple. It consists of a self-

cleaning bin, a self-cleaning, accurate weighing Aggre Meter and a floating charging hopper. All material within the plant is active and enters the truck in a premixed condition. The Aggre-Meter insures accurate weight to within one pound. Each material is weighed on a separate beam and an auxiliary dial shows the approach to the desired weight.

The floating charging hopper prevents spillage. A different type may be secured for end loading, and can be moved out of the way for direct loading into trucks. The smaller type plants come in two main sections and one top section, while the larger plants are shipped in large simplified sections.



The New Erie AggreMeter Plant for Loading Mixer Trucks

A New Oil Burning Engine

A NEW oil-burning engine for crane and shovel service has recently been announced by the Northwest Engineering Co., 28 East Jackson Boulevard, Chicago, Ill. This new engine is based on gasoline motor principles.

Among its features are the development of the carburetor apparatus for low grade fuels, adequate vaporization of the heavier fuels to permit clean burning under extremely varying conditions of load which are characteristic of crane and excavator operation, and a special means for the elimination of lubricating oil dilution.

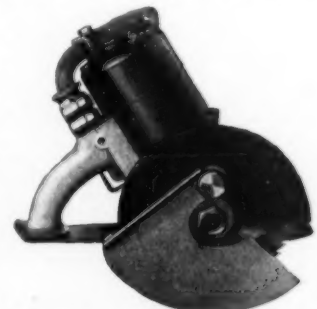
The engine is free from complicated devices or pumps and its operation is identical with that of a gasoline motor. It is started from cold on gasoline for which a small tank is provided. A valve switches the fuel after a few minutes running.

A Compact Hand Saw

THE Speedway heavy-duty electric hand saw, the weight of which has been cut down wherever possible without sacrificing strength, is made by the Speedway Manufacturing Co., Cicero, Ill., for use in building and general maintenance and repair work.

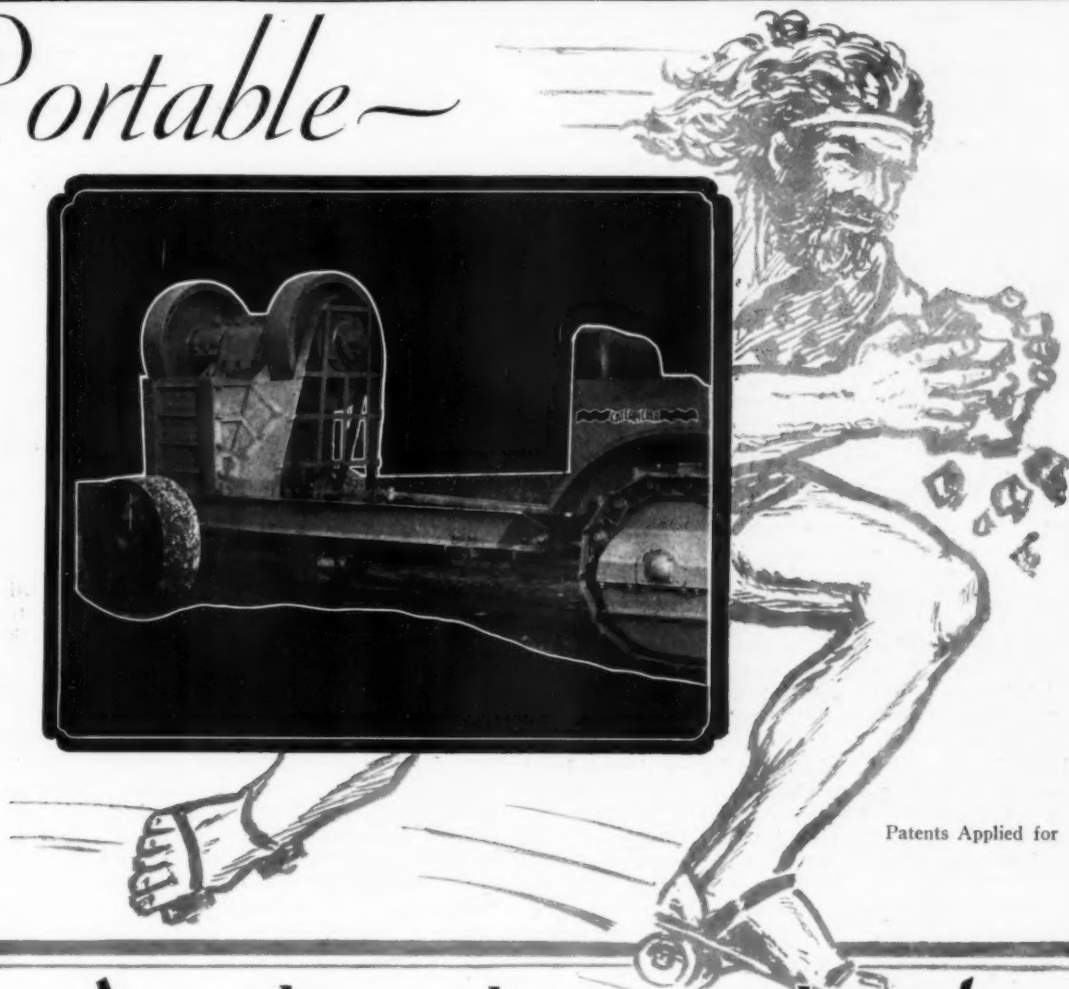
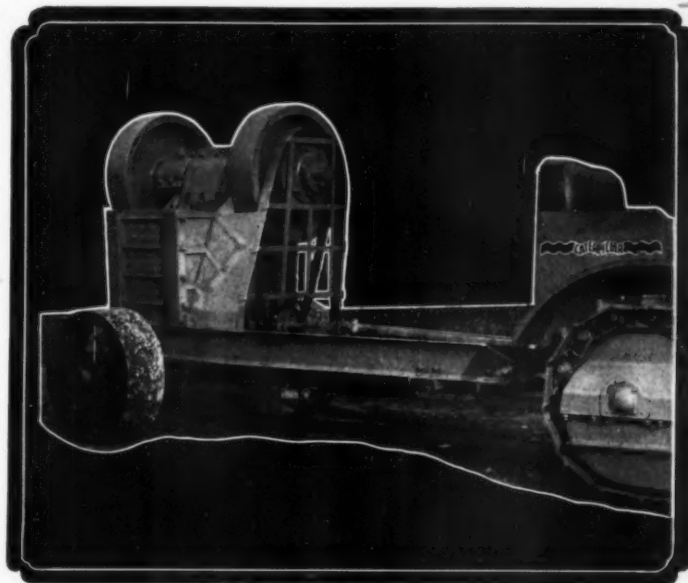
This saw, known as Type 175, weighs only 14 pounds, is 12 inches long, and has a blade 6 inches in diameter. The depth of its cut is $1\frac{3}{4}$ inches and its speed 3,800 rpm. The motor operates on both A.C. and D.C. on a current of 32, 110 and 220 volts.

The switch is of the return spring type for safety and the blade is protected at all times by a saw guard. It is equipped with a 6-inch rip or cross-cut blade and an 8-foot rubber lead cord with a soft rubber split plug connection. A 7-inch diameter blade for $2\frac{1}{4}$ -inch cuts can be furnished extra.



The Type 175 Electric Hand Saw

Portable~



Patents Applied for

A rock crusher on wheels!

Easily and quickly moved to different locations . . . operated direct from "Caterpillar" Power-Take-Off . . . no loss of power through belt-slippage . . . disconnection from tractor not necessary when unit is moved . . . couplings provided to take care of alignment!

Simple in design, rugged in construction, and positive in operation—the W-K-M Day Jaw Crusher is an economical unit for bridge builders, road contractors, and others who are engaged in repair work and construction jobs. Send for complete literature descriptive of its uses and adaptations.

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Cable Address "WILKOMAC"
HOUSTON — TEXAS

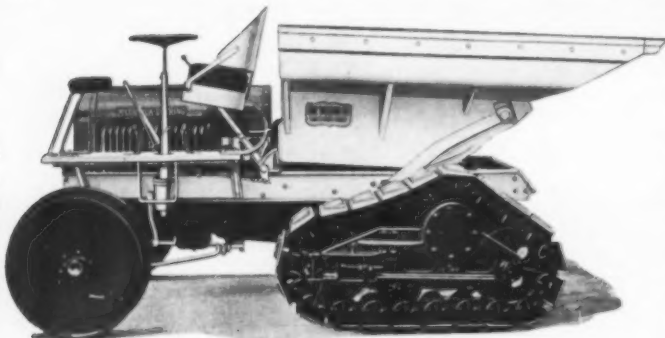


Company Inc.

EQUIPMENT

Export Office

74 TRINITY PLACE, NEW YORK CITY



The Winsor Dump Truck Equipped with Rear Crawlers

Gravity Dump Truck Equipped With Either Wheels or Crawlers

THE Winsor gravity dump truck which may be equipped with wheels or with crawlers is manufactured by the Winsor Co., Bucyrus, Ohio. The capacity of this machine is 3 yards but it can handle a heaped capacity of 4 yards. An auxiliary axle is supplied which carries the pay load and also the tractor itself, eliminating the load and twisting strain from the tractor which acts only as a power plant. The forward end of the tractor is saddled in a heavy yoke riveted to the 7-inch channel side frames. This yoke also carries the front axle pivot casting.

Disc wheels are used. The rear axles are shortened and machined to carry sprockets which drive the rear wheels by means of 2-inch pitch steel roller chains. The wheels are mounted on heavy Timken roller bearings. To enable turning on a short radius, a longer front axle with a special axle hanger is used. The patented front axle keeps the wheels straight up and down regardless of the unevenness of the ground or the tilted angle of the axle.

The steering gear is so located that the machine can be driven in either direction. Two stationary spring seats are mounted on the operator's platform front and rear of the steering wheel, the hand levers and foot pedals being so arranged that the operator can face in the direction in which he is traveling.

When the ground is in particularly slippery or unfavorable condition, the dump may be equipped with Winsor crawlers. The track wheel shafts and bearings are interchangeable, one size ball bearing being used throughout. The track shoes and links are made of Farrell-85 steel, incorporating the use of wearing links which take both the sprocket and pinwear. The tracks are supported on heavy cast steel frames by two bearings, one on the outer end of the axle, the second bearing inside of the channel frames.

Rubber tired disc wheel equipment can be furnished where it is necessary to travel over city streets and long hauls.

Two Large New Concrete Mixers

TWO new Giant 56-S and 84-S Ransome mixers have recently been announced by Ransome Concrete Machinery Co., Dunellen, N. J. These mixers are designed for use in three distinct fields, on large construction jobs, in industrial plants and for central mixing plants. The main frame of these mixers is strongly gusseted and hot riveted. There are four cross members, all of the same depth, two of which mainly support the drum roller axles and two supporting the overhead framework with the parts it carries. The drum rollers are made of genuine car wheel iron with the treads and flanges chilled.

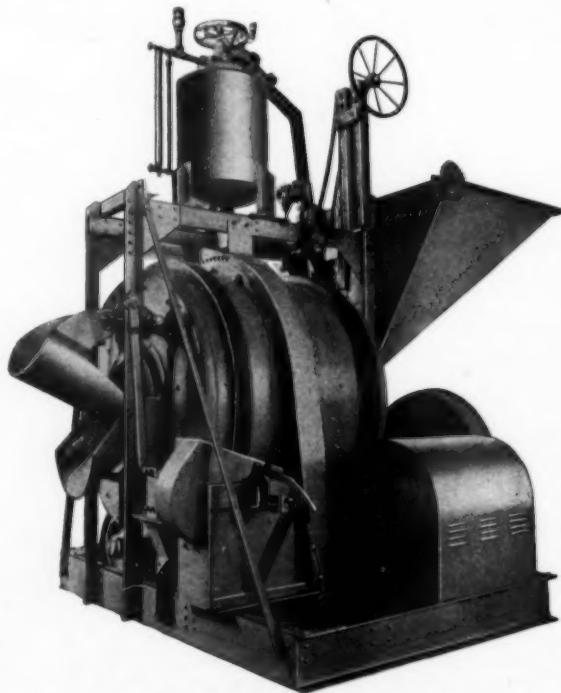
The diameter and faces are unusually large with long hubs. Timken bearings fully protected by dust caps are used. The drum roller axles are made of special alloy steel.

The drum is all steel construction with shell and heads lined. The pick-up blades have easily renewable liners and the drum roller tracks are solid locomotive tire steel. The mixing action of these machines is identical with that of all other Ransome mixers. A new feature, however, is the drum driving mechanism. A cast pedestal, part of which is machined to take the motor and the other part of which carries the countershaft bearings, forms a solid unit tying and holding these parts in place. The countershaft bearings are heavy-duty Hyatts with solid inner and outer faces. Any end float of the countershaft is taken care of by the hardened steel and bronze thrust surfaces. The motor pinion is special pre-treated steel and the large gear is cast steel. They run in a bath of oil in an oil tight gear guard.

Due to the large round discharge chute reaching back into the drum, the discharge is made in from 8 to 10 seconds on the 56-S and from 12 to 15 seconds on the 84-S. The power discharge mechanism is simple, easy to get at and the operating lever can be carried to any convenient point. Further speed in discharge can be secured by the fact that the batch hopper gate can be opened before the discharge chute is thrown up. The chute has $\frac{1}{4}$ -inch renewable liners.

The Ransome spiral cut-off water tank is standard equipment on these mixers. One turn of the control wheel changes from the maximum to the minimum amount of water that can be discharged from the tank and this change can be made instantly.

The batch hopper has a slope of 45 degrees at the back, the sides of 56 degrees and the flow is vertical. The opening is large and practically round. The gate is operated by rack and pinion. The nose and back of both the batch hopper and the chute are lined with $\frac{1}{4}$ -inch plates.



One of the New Ransome Giant Concrete Mixers for Use on Large Construction Jobs, in Industrial Plants and Central Mixing Plants



Ransome 7-S Standard Building MIXER

YOU GET THE MOST

There's no doubt about it. In the Ransome 7-S Standard Building Mixer you get the most for your money because *contractors* were really the ones who built it. From all sides, right from the field, came suggestions. Contractors told us what they wanted—

"A mixer that will stand up . . . Long Life . . . Light in weight . . . Portable . . . Easily Operated . . . Simple to lubricate . . . Large output in fast time . . . Same improved water control you put on your large mixers."

These and many other suggestions wrote the specifications for the Ransome 7-S. Point for point there's a tremendous value in this job. Everything contractors want is here. It's big value clear through with every requirement satisfied.

You get the most in the Ransome 7-S.

May we send you Bulletin 123 ?



Ransome Concrete Machinery Company

1850—Service for 80 Years—1930

Dunellen

New Jersey

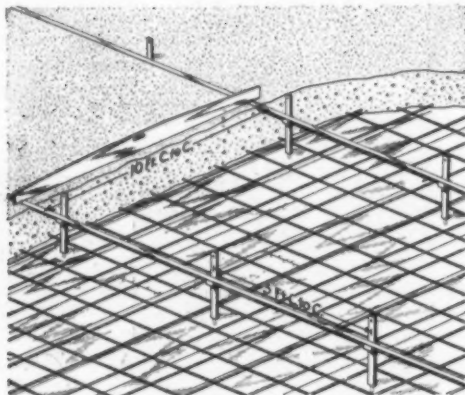


Diagram Showing Method of Placing
M & M Screed Gages

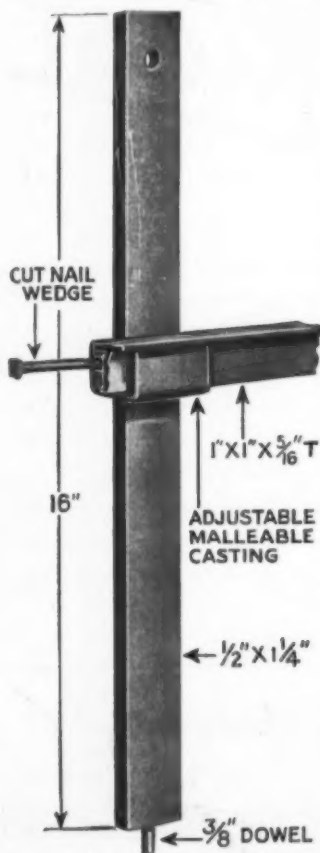
Adjustable Screed Gages

M & M adjustable screed gages for leveling concrete slabs are manufactured by the M & M Wire Clamp Co., 983 17th Ave., S. E., Minneapolis, Minn. These gages require no special tools for placing, adjusting or removing as all adjustments are made with a hammer. A hammer and a carpenter's brace with a 5/16-inch bit for boring a hole in the form deck are the only tools required for setting up the gages.

The gages are 16 inches high, giving an adjustment for slabs from 2 to 16 inches. In setting the screed gages, a

chalk line is drawn across the building at the point where it is desired to run the row of gages. Then a 5/16-inch hole is bored into the form decking where the gage is to be set, and the gage driven into the hole. The steel pin in the gage acts as a dowel and is 3/8-inch in diameter. When the gage is driven into the hole, the dowel fits tight and there is a compression of wood set up which holds the gage firmly and gives rigidity in both directions.

The screed or straight-edge is zigzagged across the T-bars and can easily pass by the extension of the gage above the slab without interference. A 1 x 1 x 3/16-inch T-bar is used. These bars are placed approximately 10 feet center to center and parallel. The gages are placed approximately 5 feet center to center on the T-bars. The casting is a malleable casting and a 20 penny cut nail is used.

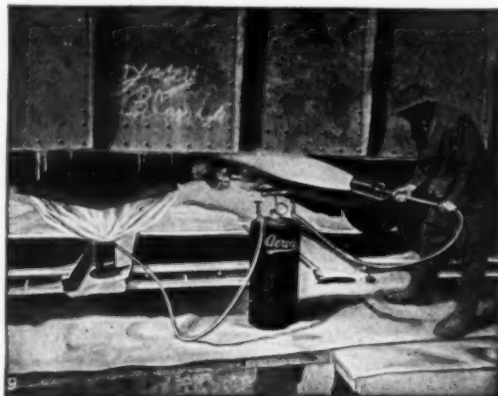


The Adjustable M & M Screed
Gage in Place on a Form

Are You Ready to Thaw Out Frozen Gondola Cars?

FREEZING weather has arrived, which means that contractors using concrete aggregate must watch out that their shipments arriving by freight can be handled promptly in spite of freezing of the water in the sand, stone or gravel. It is, of course, best to buy your aggregates from a company which has stored them for a sufficient length of time to get practically all of the water out, but, even with this precaution, sometimes a car of sand will be caught in a rainstorm or sleet storm which is immediately followed by a drop in temperature which will freeze the load up and make it practically impossible to dump it.

One of the best means of thawing out these hopper bottom cars is an oil burner which can be readily handled by one man. The Aeroil torch, made by the Aeroil Burner Co., Inc., West New York, N. J., as shown in the illustration, is very handy for this type of work. One man with a torch of this kind can thaw out in one hour what it would take five men a whole day to do with old methods. The torch is also equally good for thawing out frozen hoppers, doors, gates, conveyors, tipples, switches, derails, scales and pipes, and can



An Aeroil Torch Thawing Out Material in a
Gondola Car

be used for melting ice or snow from trestles, ladders, platforms, roofs, coal piles, mechanical loaders and all other outdoor machinery.

A New Line of Small Vertical Compressors

A NEW line of vertical, single-cylinder, single-acting type compressors which supplement the existing line of compressors of larger capacities has recently been announced by the Chicago Pneumatic Tool Co., 6 East 44th Street, New York. Sizes with piston displacements of 17½, 23 and 41 cubic feet per minute, suitable for 150 pounds maximum pressure are available in a number of drives.

The design of these compressors includes such features as Simplate flat disc air valves, a reliable automatic system of lubrication, ground cylinders and pistons as well as a neat and pleasing external finish.

The cylinder and crankcase are cast in one piece, with large hand holes in the crankcase for dismantling the reciprocating parts assemblies. The cylinder head is separate and contains the inlet and discharge valves. On the air-cooled compressors the radiation fins are cast on both the cylinder and the head, while on the water-cooled compressor water jackets extend completely around the cylinder bore and around the head.



LIFTING WATER 27 FEET

...without auxiliary help!

A New Centrifugal Record

This LaBour Contractors Pump operated by N. D. Peters & Co., in the Mohawk River cofferdam near Utica, N. Y., exhausts the air from empty suction lines, *primes itself* and lifts water 27 feet and 3 inches through 31 feet of 5" hose. No primers, foot valves or other apparatus are used.

Before installing this 4" LaBour Contractors Pump, Peters had been using both a 10" and 12" steam pump. At 31 feet they found it necessary to add a 6" duplex. When the LaBour Pump was brought in, both of the steam pumps were removed from the job. The 6" duplex, too, was removed from service but kept on hand for emergency. One 4" LaBour Contractors Pump is now handling the entire job of water removal. This interesting installation is typical of the practical service rendered by LaBour Pumps to the contracting industry.

Write for Bulletin 31

THE LABOUR COMPANY, INC.
ELKHART, INDIANA

LABOUR PUMPS NEVER LAY DOWN ON THE JOB



A C-P Class P6 Vertical Compressor of the Circulating Water-Cooled Type

the piston end with a bronze bushing and at the crank end with removable, die-cast babbitt shells. The crankshaft is an open hearth steel forging, accurately turned and ground.

The lubricating system is entirely automatic. A small gear-type pump driven by the crank-shaft supplies oil to the main bearing and to oil splash troughs into which oil throwers on the connecting-rods dip, creating a mist of oil which lubricates the cylinder walls and connecting-rod bearings. The oil control ring in the piston, and its specially designed groove, prevent oil from working past the piston and contaminating the air. An oil flow indicator shows at a glance whether or not the oil is circulating.

On the standard compressor no air regulating system is furnished but all compressors can be equipped with an unloading inlet valve, which, in combination with the Simplicity unloader, will control the quantity of air delivered by opening the inlet valve of the compressor and allowing the air drawn into the cylinder to return to the atmosphere whenever the receiver pressure reaches the maximum pressure desired. When the demand for air increases, causing a drop in pressure, the unloader allows the inlet valve to close and compression at full capacity to be resumed.

Motor-driven compressors can be equipped with automatic start-and-stop control in cases where the demand for air is intermittent. In addition to the motor control regulator the compressor is equipped with an unloading inlet valve which is placed under the control of a starting unloader which by-passes air to hold open the inlet valve when the compressor is stopped or at a speed under normal speed, so that starting of the compressor always takes place without load as does the slowing down.

Every machine is completely assembled and given a thorough running test. All final adjustments are made while the machine is operating at full speed and under full load.

A New Asphalt Plant

THE Simplicity asphalt plant, the design of which is based on a new method for producing hot-mix pavements, is manufactured by the Simplicity System Co., Chattanooga, Tenn. The plant can handle 40 tons per hour under ordinary conditions and 50 tons per hour over long runs is not an uncommon record. The plant outfit includes elevator feeders and a 100,000 gallon asphalt storage and heating system, in addition to the plant proper.

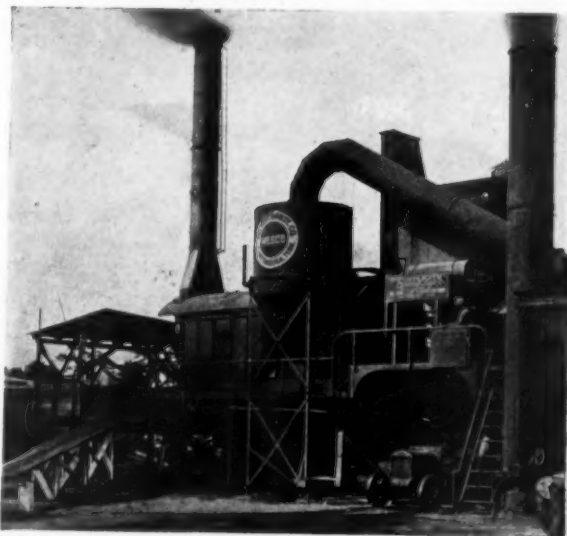
The frame of the plant is of heavy structural steel, all

Main bearing housings are bolted into covered openings in the crankcase. These openings are large enough to permit removal of the crankshaft with ease. Main bearing bushings are die-cast, removable, babbitt shells of liberal area. The piston is a strong, light casting made of hard close-grained cast iron, accurately turned and ground to exact size. Each is fitted with two pressure and one oil control ring. The piston pin is of steel, hardened and ground. The connecting-rod is an open hearth steel drop forging fitted at

plate work is of rust-resisting copper-steel, mixer bottoms, mixer teeth and elevator chains, all of which are subjected to very hard wear, are of manganese steel. The plant has ball or roller bearings throughout and a Diamond chain, assuring smooth vibrationless transmission of power, and cut steel sprockets and gears.

The chief feature of the plant is the dryer. There has been developed for the Simplicity plant a double steel dryer in which the hot inner shell is wrapped up in a blanket of cold wet material occupying the space between the inner and outer shell. The effect of this is to so cool the metal of the inner shell that it will not burn out. Also this cold wet material captures the heat that comes from the shell of the inner drum and makes use of it instead of allowing it to escape into the atmosphere. The results of this is that the dryer is economical to run and develops an unusual capacity.

All heating is done by a one-fire furnace. The control of the heat is by a system of dampers, whereby only sufficient heat is directed to the boiler to keep steam pressure to the required amount. All the balance of the heat is drawn into the hot-spot Simplicity dryer by induced draft, and the automatic feeder may be adjusted to absorb all of the heat necessary to produce hot aggregate at the required temperature. The hot gases travel through the dryer and then through conduits to the dust collector.



A Simplicity Asphalt Plant

This collector retains the valuable fine material by a vacuum process, returning the fine mineral aggregate to the hot sand elevator where it joins the other hot mineral aggregate and travels with it to the mixer.

The main power plant is a Troy engine, self-oiling, dust-proof and of rugged construction, which is placed at one extreme of the plant.

Standard equipment for the plant includes, besides the 5-compartment bin, screen and weigh-box of the plant itself and the heating system, an automatic stone and sand feeder for the cold elevator, the dust feeder for the dust elevator, a recording pyrometer temperature control, a recording steam gage and an automatic timing device on the box.

Lighter Brick Invented

A NEW type of brick has been invented in Germany which is only one-sixth the weight of common brick and is also fireproof and waterproof. It may be made in any size and color and the weight can be reduced with the increasing height of the building without in any way diminishing its carrying capacity.

Roads enough, *soon* enough, *safe* enough



QUANTITY production yielded cars enough to clog our roads. Now it will take quantity production—and equally effective economy—to provide roads enough, soon enough, safe enough to relieve the existing conditions.

Every community which approaches this problem with due attention to obtaining maximum mileage, speedy completion and safety, will be irresistibly attracted by Tarvia performance and Tarvia economy.

For 26 years, Tarvia low-cost construction and low-cost maintenance have been applied with memorable success to all types of highways. Tarvia today meets these requirements more impressively than ever—for it will take the utmost economy to provide, even from the stupendous sums available, roads enough, soon enough, safe enough.

The *Barrett* Company

New York	Chicago	Philadelphia
St. Louis	Minneapolis	Boston
Detroit	Cleveland	Birmingham
Buffalo	Columbus	Milwaukee
Providence	Syracuse	Cincinnati
Baltimore	Toledo	Rochester
Lebanon	Youngstown	Bethlehem

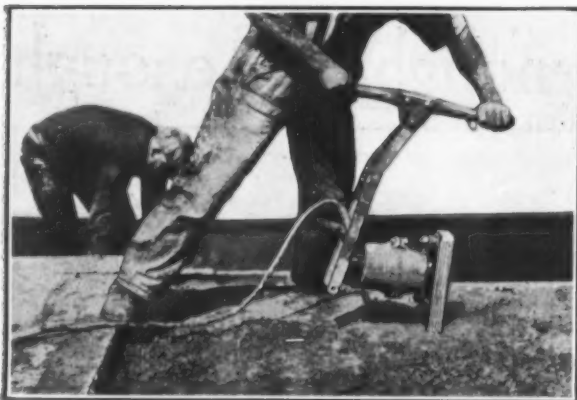
In Canada:

THE BARRETT COMPANY, Ltd.
Montreal, Toronto, Winnipeg, Vancouver

Tarvia

GOOD ROADS
at LOW COST

Please mention the CONTRACTORS AND ENGINEERS MONTHLY—it helps.



The Jackson Vibrator for Use on Floor and Deck Slabs

A New Method of Concrete Placement in Building Construction

THE placement of concrete in reinforced construction offers a problem in the elimination of honeycombing and securing water tightness which is of extreme importance to designers and contractors. It is necessary that the method of placement be such that it will insure maximum yield in concrete per bag of cement for the specified strength. At this point workability becomes the limiting factor and is of particular concern to the contractor.

A new method of concrete placement, known as Vibro-Cast and accomplished by the use of the Jackson vibratory machine, has been developed by the Electric Tamper & Equipment Co., Daily News Bldg., Chicago, Ill. These machines increase the range of workability of the concrete and eliminate expensive handspading.

The Jackson vibratory machines are operated on 110 or 220-volt 3-phase 60-cycle current. When power is not available, gas-electric generating units of various capacities may be secured. The concrete vibrator consists of a rugged totally enclosed electric motor, designed especially for this service, having but one moving part, the rotor or revolving element upon the shaft, to which is welded an unbalancing weight. This rotor, revolving at 3,600 rpm sets up powerful high frequency impulses which are transmitted to the concrete in various manners according to the nature of the work in hand.

For retaining walls, foundation walls, beams and other comparatively thin reinforced sections there is the Jackson form vibrator which is easy to handle and efficient in operation. This vibrator is equipped with a strong steel jaw vise with an opening of 8 inches for clamping to the form, subjecting it to vibration while the material is being placed.

The vibrator for placing concrete in columns consists of a vibratory motor attached to a base with adjustable feet that rest against the form surface. A chain carries the vibration around the column, it being necessary to move the machine up as the form is filled. In columns exceeding 5 feet in diameter it is usually necessary to use two machines on opposite sides.

The Vibro-Cast process is also applicable to concrete placement on bridge deck slabs and floors. High frequency vibration transmitted to the suspended form by the spud protruding through the concrete insures a slab free from honeycombing on the bottom face and the material readily flows around the reinforcement. The machines are simple in operation and their weight of 60 pounds permits their operation by one man.

High frequency vibration as applied to concrete makes possible the placing of mixes too stiff to be placed by ordinary methods. These vibrations transmitted through the plastic concrete cause a flowing and compacting of the mass and the elimination of voids. When a fixed mix is specified, it permits a reduction in water content and thus increases the strength and water-tightness of the concrete. Where a definite water-cement ratio is specified, this increases the yield of concrete per sack of cement. It insures better bond between coarse aggregate and mortar by the elimination of air pockets on the surface of the aggregate and eliminates voids around reinforcing members.

A Cold Process Asphalt Emulsion for Making and Repairing Roads

THE requirements of a good asphalt emulsion are that it should contain less than one per cent of emulsifying agents; the asphalt particles must be very small and regular in form so that the emulsion, before setting up, can absorb water without coagulating, thus permitting the use of a diluted solution when necessary; and it must be possible to make the emulsion miscible or non-miscible so that it will coagulate slowly or rapidly according to requirements. After the distillate has evaporated the asphalt remaining must retain unaltered all the qualities of penetration, ductility, and binding power it possessed before emulsification. It must also be capable of being produced from asphalts of all penetrations, high or low, and must be capable of standing frostproof storage for an unlimited time without showing sediment, coagulation or separation.

Colphalt, a chocolate brown cold process asphalt emulsion which turns jet black when set, meets these requirements. It is made by the Colphalt Co., of Ohio, Cleveland, Ohio, from both hard and soft asphalts in slow coagulating and quick coagulating solutions. It has great binding strength and is a fluid which can be poured from the bung-hole of a barrel and spread with ease or, if required, the viscosity can be increased or decreased from the consistency of water to that of a heavy cup grease. It does not become brittle in cold weather or bleed under a scorching sun.

Newly laid roads can be made more serviceable, as well as waterproof and dust-free, by an application of Colphalt, and old roadways can be built up to a greater degree of serviceability. A drum or two of Colphalt in a truck with a few yards of aggregate will enable one man to quickly repair holes in all types of pavements whether the road is slightly wet or dry. Such patches are non-skid and will not bleed, warp, soften or become misplaced by traffic. The fluidity of Colphalt carries it deeply into the substratum and binds the lower layers of stone into a solid roadway with the minimum of binder. It can be applied by cheap, unskilled labor and requires no heating, mixing or preliminary preparation.



HARD GOING MADE EASY IN LOOSE SAND
An Allis-Chalmers Monarch 75 pulling a 10-yard Western crawler dump wagon at East Chicago, Ind.

The Judgment of The Years

This 60" GOHI Corrugated Culvert installation was made in 1915 at Ray Mill Dam in North Carolina. The Consulting Engineer, under whose direction the culvert was installed, makes a sworn statement that the culvert is today in excellent condition, in spite of the extreme abrasive action to which it has been subjected during all these years.



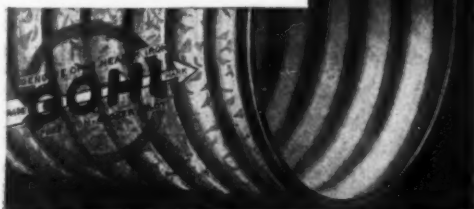
(Meets copper-bearing pure iron requirements in all accepted specifications for corrugated metal culverts.)

Corrugated Culverts have done more for Good Roads than any other type

STRENGTH—GOHI Corrugated Culverts stand up year after year under heaviest traffic conditions.

FLEXIBILITY—GOHI Corrugated Culverts are flexible — cannot crack or break under shifting earth fills or the tremendous pressure of freezing water.

ECONOMY—GOHI Corrugated Culverts are comparatively light, and may be hauled, handled and installed with minimum labor and cost. Installations easily made between sunup and sundown.



Time — the court of last resort — sets its unqualified approval on GOHI Corrugated Culverts for modern road drainage.

Made of Genuine Open Hearth Iron, pure iron-copper alloy, they offer maximum resistance to corrosion and are outstanding for durability in the metal culvert field.

Thousands of installations conclusively prove that GOHI Pure Iron-Copper Alloy outlasts any iron or steel and gives the lowest-cost-per-year service of any culvert material. Specify GOHI Corrugated Culverts for economy and permanence. Any GOHI Culvert Fabricator listed below can furnish authoritative technical service on any culvert installation.

GOHI CULVERT MANUFACTURERS, Inc., Newport, Ky.

Capital City Culvert Co.
Madison, Wis.

Central Culvert Co.
Ottumwa, Iowa

Denver Steel & Iron Works Co.
Denver, Colo.

A. N. Eaton, Metal Products
Omaha, Nebr.

Feenaughty Machinery Co.
Portland, Oregon

Lincoln Steel and Forge Co.
St. Louis, Mo.

Newport Culvert Co.
Newport, Ky.

Pennsylvania Culvert Co.
Philadelphia, Pa.

Roanoke Sales Corp.
Roanoke, Va.

St. Paul Corrugating Co.
St. Paul, Minn.

Tennison Brothers
Oklahoma City, Okla.

Tennison Brothers
Texarkana, Ark.



The Tractor Tractor Attachment for Trucks

Tractor Attachments for All Models of Trucks

TRACTOR attachments which are readily and easily attached without alteration and convert any standard 4-wheel truck, old or new, into a tractor-truck, are manufactured by the Trucktor Corp., 156 Wilson Ave., Newark, N. J. These high-speed crawlers, known as Trucktors, are made of special alloy steel and heat-treated. Their open design makes them self-cleaning and assures positive drive in any ground condition and they are provided with a set of separate coil springs for automatic track tension and take-up.

Trucks equipped with Trucktors can operate on or off the highway, changing from standard wheeled vehicles into truck-tractors or vice versa in a few moments. When operating on highways without tracks, this attachment converts trucks into rubber-tired high-speed six-wheelers, thus doubling the service of the trucks.

A New Crawler-Mounted Crane

A NEW full-crawler mounted, full-revolving convertible machine which includes the features of Keystone skimmers for street and road excavations and the Keystone pullscoops for ditching, is now manufactured by the Keystone Driller Co., Beaver Falls, Pa. This new 25-ton machine handles a $\frac{3}{4}$ -yard bank scoop or dipper, a 1-yard or a $1\frac{1}{4}$ -yard oversize skimmer, the full range of pullscoop trenching buckets, 14 to 64 inches in width, and a $\frac{3}{4}$ -yard clamshell.

The car body is a heavy one-piece steel casting. The roller path is 71 inches outside diameter, is mounted and centered on a machined seat on the car body casting and is keyed and bolted in place. Four axles, extending entirely across and underneath the car body, carry the eight crawler wheels. The axles are locked against rotation and the crawler wheels turn on the axles. The two center axles are located in stationary bearings cast integrally with the car body and capped to permit easy removal of axles, while the two end axles are adjustable, being guided on heavy machined seats cast integrally with the car body. All axles are of heat-treated alloy steel while crawler shoes and rollers are made of special alloy, electric furnace steel.

The machine is powered with a Climax Blue Streak 4-cylinder 79-horsepower engine of the valve-in-head type with automatic spark control. Power is taken from the

transmission shafts to the vertical travel shaft through gears and a jaw clutch. Chain sprockets located at either end of this shaft drive the crawler drive sprockets through the roller chain. The crawler drive sprockets float on a fixed axle extending entirely across and underneath the car body and are keyed to the hubs of the crawler drive sprockets.

Steering is accomplished by withdrawing one of these jaw clutches and positively locking the chain sprocket, which in turn locks one crawler belt. The full engine power can then be put on the live crawler belt for steering. A powerful brake, located on the vertical travel shaft, is equally effective as a digging lock in either direction or to control the machine on a grade.

The hoist drum shaft is connected to the main transmission shaft through a pair of spur gears. Both drums are mounted on this shaft and are operated by outside band clutches. The drums are 18-inch diameter and one lagged to 24-inch diameter for clamshell work.

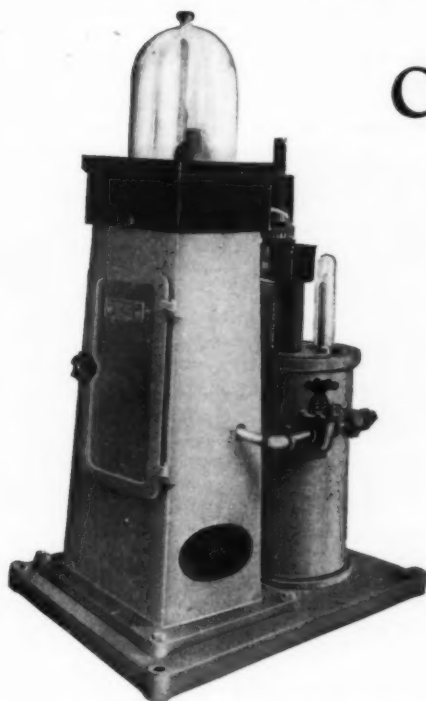
A power operated boom-hoist is furnished as standard equipment. A cone-type friction clutch, cam set and spring released, is used for the boom-hoist and is located on an extension of the drum shaft. Power is transmitted to the boom-hoist through spur gears, the boom-hoist being a self-contained unit assembled in a cast steel frame which is fastened to the side of the main turntable casting. The boom-hoist drum is provided with a double safety device, including a ratchet, pawl and automatic brake. This brake is set by a counterweight and if the boom starts to drift down, additional braking action can be secured by the brake hand-lever.

Crawler shoes and rollers are made of special alloy electric furnace steel. Large diameter steel pins are used in the shoes and have bearing across their entire width, to reduce wear to a minimum.

This machine is easily convertible and operates as a shovel, skimmer, ditcher or dragline, and attachments for these various uses can be quickly installed.



The New Keystone Whirler



Solution Feed CHLORINATORS

30% MORE
EFFICIENT

at New Haven

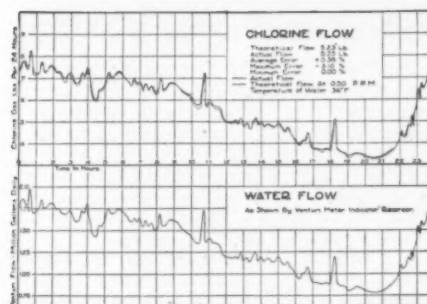


Diagram showing accuracy of *W&T Automatic Vacuum Type ASV Solution Feed Chlorinator* at Maltby No. 1, New Haven Water Company.

Note: The flow of chlorine varies exactly with the flow of water

NEW HAVEN—with its enviable record for safe water and freedom from typhoid fever—has just announced a finding of first importance to water works and health officials. (See page 477 *Water Works Engineering*, Vol. 82, No. 8.)

Based on several years experience with chlorination by both solution and direct feed methods of application, they find:

SOLUTION FEED { 37.2% more efficient at Lake Dawson
27.6% more efficient at Maltby No. 1

The higher efficiency of *solution feed* chlorination over direct feed chlorination as proven at New Haven holds wherever chlorine is used—whether for water sterilization, sewage disinfection, swimming pool sanitation, odor control, or for industrial uses.

In many plants the savings in chlorine alone—to say nothing of the maintenance savings and ease of operation—will pay for a duplicate Chlorinator.

And *W&T Solution Feed Chlorinators* make use of the vacuum principle of control—that insures long life and rugged dependability.

WRITE FOR TECHNICAL PUBLICATION No. 99

"The only safe water is a sterilized water"



WALLACE & TIERNAN

COMPANY, INCORPORATED

Manufacturers of Chlorine Control Apparatus

NEWARK NEW JERSEY



NEW YORK CHICAGO KNOXVILLE SAN FRANCISCO MINNEAPOLIS PITTSBURGH DALLAS KANSAS CITY
LOS ANGELES SEATTLE ST. LOUIS BUFFALO INDIANAPOLIS DETROIT BOSTON JACKSONVILLE
CHATTANOOGA CHARLOTTE OKLAHOMA CITY PHILADELPHIA SPOKANE OGDEN
WALLACE & TIERNAN, LTD., TORONTO, CANADA WALLACE & TIERNAN, LTD., LONDON, ENGLAND

3A-18



A 4-ton Brookville Industrial Locomotive

New Models of Industrial Locomotives Powered by Tractors

SEVERAL new industrial locomotives in 4, 5 and 6-ton models have been developed by the Brookville Locomotive Co., Brookville, Pa., for use with Model 20 McCormick-Deering or International Harvester tractors. Transmission is a standard International Harvester product of the four-speed selective type, with final or direct drive through the heavy Brookville reverse.

These locomotives are equipped with steel tired drive wheels which give 25 per cent more traction with the same percentage of added pulling power. Due to the combination of Brookville spring journals and drive wheels with 4-inch face and 1½-inch flange, these locomotives hang to the rail, regardless of the crookedness or roughness of the track. The wheelbase on these models is 42 inches.

A standard seating arrangement is used on all models, with foot clutch and accelerator control, thus leaving the hands free for gear shift, brake and sand control levers.

A New Truck Body for Carrying Concrete

THE rapidly growing industry of ready-mixed concrete, not only of pre-mixed concrete but also of that mixed en route to the job, has resulted in the development of a number of truck bodies as a means of conveying this concrete to the job and maintaining a perfect mix. A recent addition to this type of equipment is the RMC concrete carrier, manufactured by the Good Roads Machinery Co., Kennett Square, Pa. A feature of these carriers is the fact that they



The RMC Concrete Carrier

are adaptable to the transportation of batches of pre-mixed concrete as well as dry batches to be mixed en route, the water content being added at the loading plant.

The RMC carrier consists of a revolving cylindrical steel tank, of rivet weld construction, supported by two heavy forged steel trunnions which rotate in heavy duty, self-aligning roller bearings. Two pairs of heavy steel fins or blades are attached to the interior of the tank opposite each other and run lengthwise. The blades in each pair converge in the two sets, the purpose of this arrangement being to promote end motion of the materials simultaneously with the rotary and mixing action. This dual action speeds up the mixing time when mixing en route, and is designed to eliminate the possibility of segregation and to develop more complete hydration. The blades are so supported that clearance is provided between the lower edges and the shell of the tank. Worn blades may easily be removed and new ones inserted in their place.

The drum is rotated by an 8-horsepower LeRoi 2-cylinder gasoline engine, with a variable throttle control through which various speeds can be quickly obtained. The engine is equipped with right angle power take-off, and this, through a chain drive, operates a pinion meshing on a segment gear on the drum. A brake is provided to facilitate stopping the drum in the desired position. The drum and power plant are mounted on structural steel A frames and two 6-inch, 15.3-pound ship channels, which serve as sills for attaching the complete unit to the truck and lift hoist.

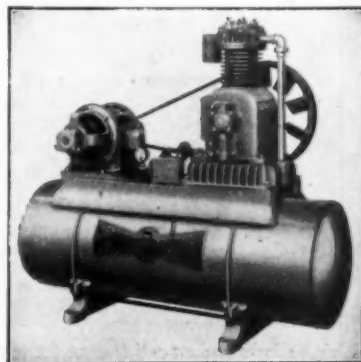
RMC carriers can be operated with any size batch up to the maximum specified and are not restricted to any batch content, wet or dry, other than their maximum capacity, which makes them adaptable to varying delivery requirements.

A New Air-Cooled Single Stage Compressor

A NEW model air-cooled single stage compressor, known as A-C-E Model, has recently been developed by the Gardner-Denver Co., Denver, Colo. It consists of a 3½ x 4 duplex compressor and a 5-horsepower motor mounted on a cast iron base on top of the air receivers. The unit has a displacement of 26 cubic feet per minute, operating at a rate of 600 revolutions per minute, which can be reduced or altered to meet the requirements of the job.

An outstanding feature of this compressor is the enclosing of the suction and discharge valves in separate compartments, the use of which prevents the air being heated when passing through the intake valves. An automatic or hand operated start and stop control is furnished as standard equipment, and is operated in conjunction with the Penn type pressure and moisture unloader. This unloader is set to cut in at 30 pounds and out at 165 pounds, thereby assuring continuous operation.

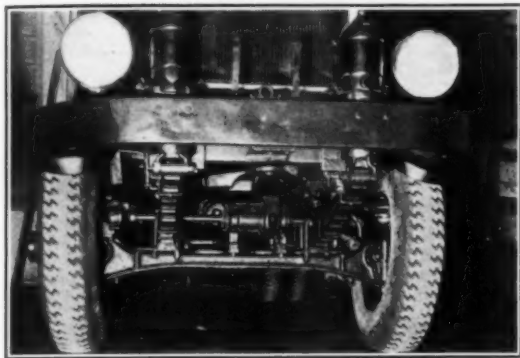
Lubrication for the compressor is by the controlled splash type. A positive driven plunger pump on the outside of the crankcase feeds filtered oil to the troughs under the connecting rods. A special oil ring and groove on the piston prevents oil from passing over to the discharge lines and an oil level gives positive indication of the amount of oil in the reservoir.



The A-C-E Single Stage Compressor

FREEMAN

4 wheel drive TRUCKS



The FREEMAN with Its New Type Bevel Gear Driving Axle Steers as Easy as a Pleasure Car

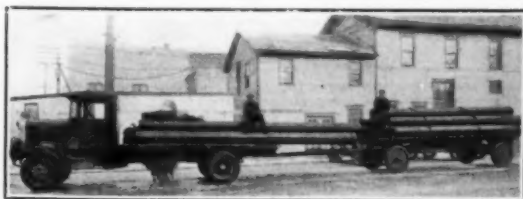
PREVIOUS types of Four-Wheel Drive Trucks had the advantages of additional traction, overbalanced by disadvantages in steering, due to the use of a universal joint steering axle. This type of axle always steers hard when power is applied, because of friction developed by the angularity of the point.

To meet all requirements and yet remove this disadvantage, FREEMAN, after years of careful engineering, has developed a new type of four-wheel drive, front-wheel-steer truck, which finds its highest perfection in these new FREEMAN models. All the disadvantages of universal joint design have been successfully removed with a bevel design front-steer drive, running in oil, in weather-proof housings.

The FREEMAN Four-Wheel Drive has easy steering, as easy as a pleasure car. A child can turn the wheels. Yet there is high power, giving the owner a high-speed express truck, which through its range of eight forward speeds can adapt itself to the paved streets of city or village as well as the farm, oil, lumber, road-building or general contracting fields.

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The 3 O. K. Portable Compressors of 120-cu. ft. displacement used on this bridge job have proved very economical and efficient in every respect and the contractors, The Wiley-Maxon Construction Co. of Dayton, Ohio, are pleased with their performance. On this new bridge, the largest multiple-arch concrete highway bridge in the world, each compressor supplied air continuously to 2 jackhammer drills on the pier footings and elsewhere about the job when needed.

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Its purpose is to demonstrate and advertise the exclusive safety feature of the visible screw and power of the larger Simplex Jacks, and will be sent you prepaid for 95 cents—Canada 45 cents. Money refunded without question and instantly if not satisfied.



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CATALOGS for CONTRACTORS

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A NEW PORTABLE BLOWER

Literature describing a new portable blower which has a capacity of 2,000 feet per minute, weighs 70 pounds, is portable with one hand and is powered by a built-in air-cooled gasoline engine, may be secured from Homelite Corp., 71 Riverdale Ave., Port Chester, N. Y.

A NEW 4-CYLINDER INDUSTRIAL ENGINE

Fuller & Johnson Mfg. Co., Madison, Wis., will be glad to send to those interested complete information in regard to the new Model BC 4-cylinder, 6 to 10 horsepower industrial engine for operating concrete mixers, air compressors, sprayers, centrifugal, rotary and power force pumps and similar uses.

HYDRAULIC OIL-POWER JACKS FOR INDUSTRIAL USE

A complete description of the Blackhawk hydraulic oil-power floor lift jack which has a capacity of 12 tons from 2 inches off the floor on the toe and 20 tons from the top of the ram, may be secured from the Blackhawk Mfg. Co., Milwaukee, Wis.

A NEW METHOD OF CONCRETE PLACING

A new method of concrete placement, known as Vibro-Cast and accomplished by the use of the Jackson vibratory machine, which increases the range of workability of the concrete, eliminates expensive hand spading and insures better bond between coarse aggregate and mortar, is described in literature which may be secured from the Electric Tamper & Equipment Co., Daily News Bldg., Chicago, Ill.

PORTABLE FLASHING WARNING SIGNAL

The National Carbon Co., Inc., New York, will gladly send a copy of its Form J-1003, describing the Eveready dry battery operated portable flasher for use in warning against highway hazards in road building, paving, excavating, grading and bridge and culvert construction.

BOOKLET ON STEEL BRIDGES

An interesting, well-illustrated booklet picturing and describing steel bridges throughout the world and describing the various features of steel bridges, has been published under the title "The Superiority of the Steel Bridge," by the American Institute of Steel Construction, Inc., 200 Madison Ave., New York, who will be glad to send copies to interested contractors and engineers.

WELDED STEEL AND WROUGHT IRON PIPE

Under the title "Design Standards for Oxwelded Steel and Wrought Iron Piping" the Linde Air Products Co., 30 East 42nd St., New York, has issued a booklet, the first of a series, designed to furnish handbook information on the fundamental designs used in oxwelding steel pipe which also apply to wrought iron pipe, including line welds, welded flanges, welded fittings and welded headers.

TESTING SERVICES

The Pittsburgh Testing Laboratory, Pittsburgh, Pa., has issued a new brochure outlining the professional service and facilities offered and giving instances where this service has saved time, labor and money for the contractor.

HOISTING AND CONVEYING EQUIPMENT

A 72-page booklet describing the line of Wright chain hoists, trolleys and hand cranes, all of which are tested to insure safety while using them, will be sent on request to those interested by the Wright Manufacturing Co., Bridgeport, Conn.

BOOK ON LATHES, THEIR INSTALLATION AND MAINTENANCE

The Monarch Machine Tool Co., Sidney, Ohio, will be glad to send to those interested a copy of its new book containing a description of Monarch lathes for use in contractor's machine shops on construction jobs, as well as their installation and maintenance.

A TWO-STAGE COMPOUND AIR STAGE COMPRESSOR

A V-type two-stage compound air compressor, among the features of which is the sturdy, one-piece cast steel frame, Timken roller bearing truck steer, special design crankshaft and connecting rods, air pressure regulator and centralized automatic control, is described in literature which National Brake & Electric Co., Milwaukee, Wis., will send on request.

A COMPLETE LINE OF CONCRETE EQUIPMENT

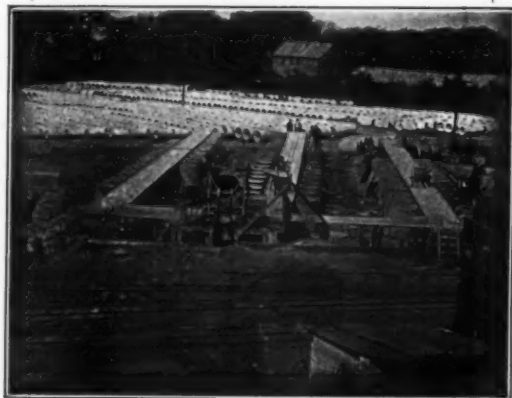
A 48-page booklet describing the complete line of Miles concrete equipment including block machines, hand and power strippers, power tampers, elevators and feeders in a variety of types and styles, may be secured from the Miles Manufacturing Co., Jackson, Mich.

A COMPLETE LINE OF TRENCHERS AND BACKFILLERS

Literature describing the complete line of Parsons trenchers and backfillers which are rugged and sturdy and designed for heavy duty may be secured by those interested from Parsons Co., Newton, Iowa.

Newark
 REINFORCED CONCRETE PIPE
"It makes a better joint"

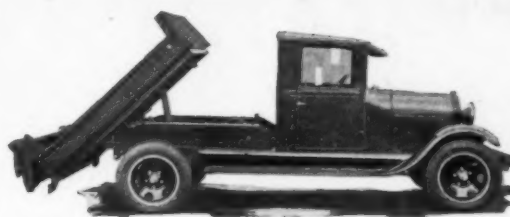
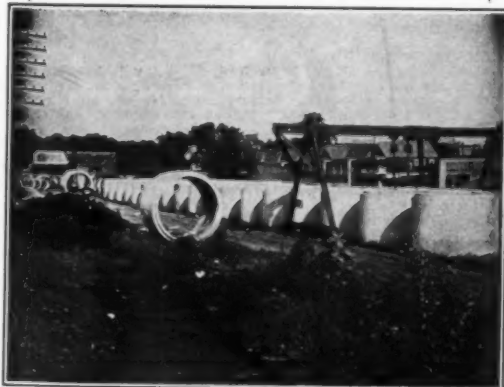
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It's a remarkable unit in many ways—in low price, uniqueness of design, in power and speed and in its sturdy, fool-proof construction. It gives a 45-degree dumping angle and dumps full load in about 6 seconds. Made for Ford and Chevrolet Trucks.

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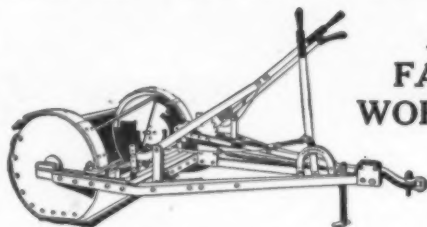
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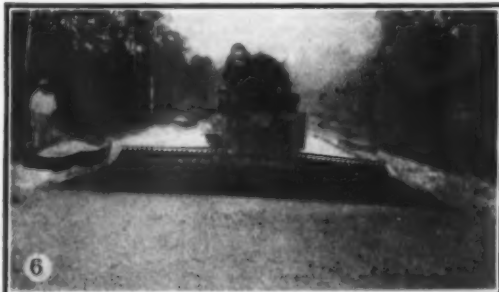
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A new heavy-duty unit combining the dirt-handling features of a truck, tractor and bulldozer, known as the Dumptor, one of the features of which is the power plant consisting of twin four-cylinder engines which provide a continuous flow of power to the multiplanes for traveling in most varieties of ground conditions without steering clutches, is described in literature which may be secured from the Kochring Division of the National Equipment Corp., Milwaukee, Wis.

FIFTEEN AND TWENTY-TON LOCOMOTIVE CRANES

A 16-page booklet describing Thew-Lorain locomotive cranes which have capacities of 15 and 20 tons and are powered by electric motors, gasoline or diesel engines may be secured by those interested from the Thew Shovel Co., Lorain, Ohio.

PORTABLE PUMP HANDLING UP TO 8,250 GALLONS

Models 150 and 200 Unipumps for draining cellars, trenches, man-holes, cofferdams, quarries and similar work, which are built in two sizes with capacities up to 8,250 gallons per hour and can handle up to 25 per cent of solids without clogging, are described in Bulletin No. 150 of the Union Iron Works, Inc., West Shore Siding, Hoboken, N. J.

A CONVERTIBLE 1/4-YARD SHOVEL

Catalog 30 containing a complete description of the Giant Half-Yard, among the features of which are 1/4-yard dipper, live boom, automatic brakes, 3-drum control, long reach, cable crowd and full circle swing, may be secured from the Mead-Morrison Mfg. Co., 125 Prescott St., Boston, Mass.

BORING THE HOLE AND SETTING THE POLE

An 18-page booklet describing the Highway earth boring machine and pole setting equipment for boring holes and setting poles in all kinds of dirt, sand, gravel, shale, hardpan, gumbo or frozen earth will be sent on request by the Highway Trailer Co., Edgerton, Wis.

A 27-E PAVER WITH MAST PLANT

Ransome Concrete Machine Co., Dunellen, N. J., will be glad to send to those interested a complete description of the portable concrete mixing and placing unit for pouring concrete in retaining walls and similar structures, which consists of a 27-E paving mixer with a steel mast and bucket and hoist.

MOVING THINGS

This is the title of a booklet describing Caterpillar tractors and their use in moving heavy equipment and materials, in demolition and general contracting and construction work which the Caterpillar Tractor Co., San Leandro, Calif., will be glad to send on request.

A 1/4-YARD CONVERTIBLE EXCAVATOR

General Excavator Co., Marion, Ohio, will be glad to send to those interested complete information in regard to the General 1/4-yard convertible excavator, which may be used as a clamshell, back hoe, dragline, skimmer or crane.

ARC WELDING OF PIPE LINES

This is the title of a booklet describing the use of electric arc welding as well as the complete line of Lincoln Stable-Arc welding equipment and may be secured by those interested from the Lincoln Electric Co., Cleveland, Ohio.

WHEELS FOR LIGHT TRUCKS

American wheels for Chevrolet and Ford trucks, among the features of which are interchangeability, strength, light weight and accessibility, are described in literature which may be secured from the American Welding & Mfg. Co., Warren, Ohio.

SIX-CYLINDER ROAD ROLLERS

Six-cylinder road rollers in 5, 7, 10 and 12-ton sizes for rolling crushed stone, Amiesite, scarifying, rolling the sub-base and similar operations are described in literature which may be secured from Ames Iron Works, Oswego, N. Y.

DIAPHRAGM FORCE PUMPS

The Tool & Device Corp., Waterford, N. Y., will be glad to send to those interested complete information in regard to the Tadco Parker contractors' pumps, among the features of which are more power, increased pumping capacity, small gasoline consumption, lighter weight and automatic lubrication.

A NEW 25-TON DIESEL-OPERATED CRANE

Complete information in regard to the new 25-ton diesel-operated crane which feature low operating cost and the ability to start and stop quickly will be sent to those interested by the Industrial Brown-hoist Corp., Cleveland, Ohio.

RELIABLE ROAD PUMPS

A complete description of Barnes Triplex road pumps, among the features of which are roller bearings on all shafts, positive oiling, dust proof cases, plunger sleeves and three point suspension, may be secured from the Barnes Mfg. Co., Mansfield, Ohio.

A FIBERED ASPHALT PLANKING

Servicised fibered asphalt planking which is waterproof, deadens noise and vibrations, is not slippery, is economical and durable, is described in literature which the Servicised Premoulded Products, Inc., 53 West Jackson Blvd., Chicago, Ill., will be glad to send on request.

A SAND AND GRAVEL PUMP

Catalogs describing the sand and gravel pump driven by a gasoline engine as well as other hydraulic dredges, dredging pumps and machinery may be secured from the Ellicott Machine Corp., Baltimore, Md.

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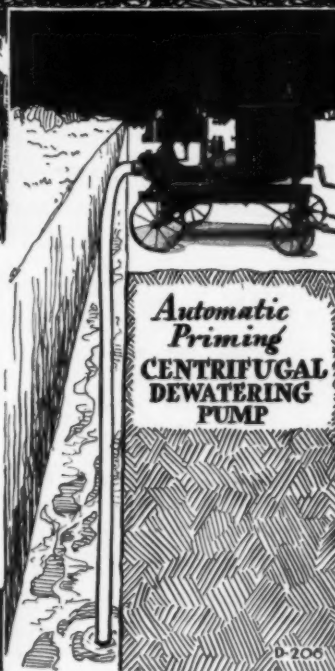


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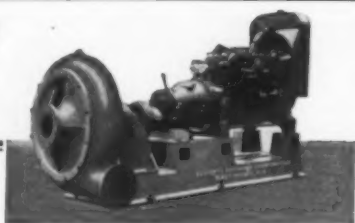
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A STRONG AND RESILIENT SAFETY GUARD-RAIL

Chain Belt Co., Milwaukee, Wis., will be glad to send to those interested literature describing the Ramsay safety guard-rail which meets the impact of a collision with a cushioning action that absorbs the shock and stops the car, thereby minimizing the possibility of injury to the passengers and damage to the car and the rail.

A COMPLETE LINE OF PNEUMATIC MACHINERY

A large, thumb-indexed volume describing the complete line of Ingersoll-Rand products, including compressors, pumps, condensers, oil and gas engines, drills, drill sharpeners and tampers as well as containing considerable engineering data in regard to the use of these products, may be secured from Ingersoll-Rand Co., 11 Broadway, New York.

MIXERS FOR PLASTER AND MORTAR

Literature describing M-B over-hand mixers for plaster and mortar, among the features of which are springs on the axle, substantial steel housing, high grade engine, and auxiliary wide axle, may be secured from the Meili-Blumberg Co., Inc., New Holstein, Wis.

OPEN ROADS AT LOW COST

This is the title of a folder describing the use of Trackson McCormick-Deering tractors in breaking through snow blockades, patrol work to keep the roads open and snow removal and will be sent to those interested by Trackson Co., 500 Clinton St., Milwaukee, Wis.

A LIGHT, COMPACT MIXER

A complete description of the new Gilson Automix, a light, compact mixer with $\frac{1}{4}$, $\frac{1}{2}$, and 1-bag capacities, which features speed in moving, speed in mixing and speedy trouble-free performance, may be secured from the Gilson Bros. Co., Fredonia, Wis.

A PORTABLE CRUSHER FOR USE WITH TRACTOR

Day Pulverizer Co., Knoxville, Tenn., will be glad to send to those interested complete information in regard to the Day portable jaw crusher for use with a Caterpillar tractor which can handle material up to $1\frac{1}{2}$ inches at the rate of 80 to 100 tons and material $1\frac{1}{2}$ to 3 inches at the rate of 100 to 150 tons per 10-hour day.

PORTABLE AIR COMPRESSORS

Bulletins describing the Buhl portable air compressors in 36, 55, 90, 100, 110, 220 and 330-cubic foot capacities with any mountings may be secured by those interested from the Buhl Co., Old Colony Bldg., Chicago, Ill.

AN AUTOMATIC REVOLVING SCRAPER

Literature describing the Wiard automatic revolving scraper, a 3-in-1 tool for excavating, grading and spreading, may be secured by those interested from the Wiard Plow Co., Batavia, N. Y.

A PUMP FOR EVERY CONTRACTING NEED

Literature describing the Humdinger contractors' centrifugal pump which picks up a 28-foot suction lift, takes air along with water and passes large solids without clogging will be sent to those interested by the Ralph B. Carter Co., Hackensack, N. J.

SOLUTION FEED CHLORINATORS

Technical Publication No. 99 describing the process of solution feed chlorination for water sterilization and the W & T solution feed chlorinators may be secured from Wallace & Tiernan Co., Inc., Newark, N. J.

AUTOMATIC CONVEYORS

Chicago Automatic Conveyor Co., 1853 South 55th Ave., Cicero, Ill., will send to those interested literature describing the Chicago automatic conveyors which are cutting loading and unloading costs for contractors.

A NEW CRAWLER-MOUNTED REVOLVING CRANE

Literature describing the new Keystone Whirler Model 17, a new full-crawler mounted, full-revolving convertible machine which operates as a shovel, skimmer, ditcher or dragline, may be secured from the Keystone Driller Co., Beaver Falls, Penna.

A REVOLVING TRACTOR SCRAPER

The Groundhog revolving tractor scraper for road grading, airport construction, excavating work, fills and general leveling operations, which works fast, loads, spreads or dumps under forward draft and is made in three sizes, is described in literature which the Roderick Lean Co., Dept. C.E.M., Mansfield, Ohio, will be glad to send on request.

A WOODWORKER FOR PREPARING FORMS

A bulletin describing the Jones Super woodworker equipped with swinging arbor and tilting table, bevel ripping and other cuts necessary for preparing forms may be secured by those interested from the Jones Superior Machine Co., 1258 W. North Ave., Chicago, Ill.

A COMPLETE LINE OF EXCAVATORS

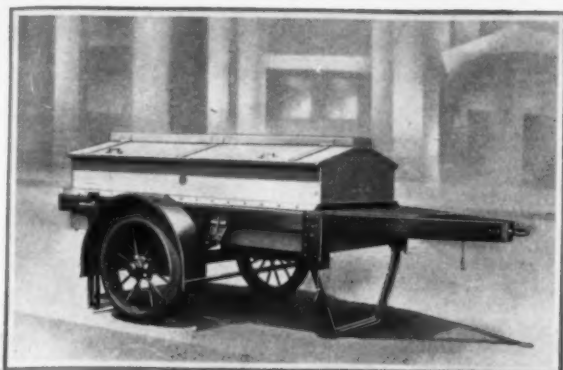
The Marion Steam Shovel Co., Marion, Ohio, will be glad to send to those interested its new Bulletin 343 describing its line of Type 450 $1\frac{1}{4}$ -yard excavators in electric, diesel-electric and gas-electric powers.

TRACTOR ATTACHMENTS FOR ALL MODELS OF TRUCKS

Literature describing Trucktors, special 24-inch alloy steel crawler tracks of open self-cleaning design, which easily and quickly convert any standard truck, either old or new, into a truck-tractor may be secured from the Trucktor Corp., 156 Wilson Ave., Newark, N. J.

NEW MODELS OF INDUSTRIAL LOCOMOTIVES

Brookville Locomotive Co., Brookville, Pa., will be glad to send to those interested literature describing its new 4, 5 and 6-ton industrial locomotives which are powered with McCormick-Deering or International Harvester tractors.



THE HEAVY DUTY TOOL BOX

LITTLEFORD Tool Boxes are not only made of steel and mounted on strong running gear—they are designed for accommodation of tools and equipment used by maintenance departments. In three styles—Heavy Duty, Utility (both portable), and Stationary. There is a size and price for you. Write for complete information. You'll be under no obligation.

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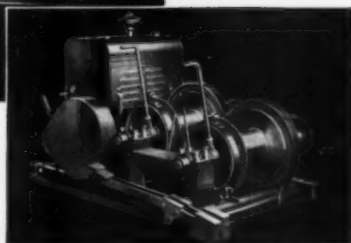
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ESPECIALLY for those short-time jobs that require a hoist for a few hours or a few days . . . for material handling and elevator work on small buildings . . . for all jobs where ease and speed of moving equipment are important . . . the most serviceable hoist and the one demanded by contractors is the hoist stripped of every excess pound.



DAKE LG HOISTS

Gasoline or electric powered, meet the demands for light equipment. Models up to 20 H.P. are light because they are all-steel electric arc-welded and have the distinctive Dake one-piece frame. Other models up to 27 H.P. are equipped with Timken bearings.

DAKE ENGINE COMPANY

DAKE ENGINE CO.
Grand Haven, Michigan.

Please send, without obligating me, your catalog describing the new DAKE LG Hoists.

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LOOMIS "CLIPPERS"

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This self-propelling Loomis "CLIPPER" drill is specially designed for your work. Fitted with crawler or round wheels. All levers are within easy reach of the operator. Steel or wood frame furnished.



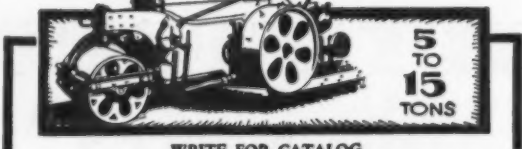
The Loomis "CLIPPER" drill is unequalled for drilling blast holes, building and foundation tests, mine air shafts, coal prospecting stripping, mineral tests, oil and water wells. Write for our illustrated bulletin.

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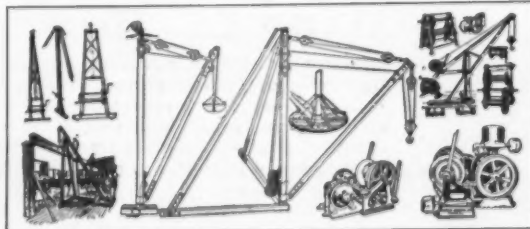
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It is packed full of interesting and valuable information on the work of the Sauerman Slackline Cableway on practically every kind of excavating job. There are many pictures and diagrams showing just how this cableway digs, conveys and elevates. And it shows how many users are cutting costs. It may show you how, too. Send for your copy today.

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TWO STRAIGHT WHEEL GRADERS

The Austin-Western Road Machinery Co., 400 North Michigan Avenue, Chicago, Ill., will be glad to send to those interested complete information in regard to the Austin Mammoth Junior 10-foot straight wheel grader and the Mammoth Senior 12-foot straight wheel grader, both of which are made with the arched frame, the quick acting rack and pinion type blade lift, a blade circle with a massive steel casting fitted with an improved latch and a steerable offset engine hitch.

NEW MIXER MODELS

Literature describing the new 1930 tilting and non-tilting Republic mixers in 3, 3½, 5, 7, 10 and 14-foot sizes with wheelbarrow hopper or power loader, water tanks, chutes, pumps and other attachments, may be secured from Republic Iron Works, Tecumseh, Mich.

A WELLPOINT DRAINAGE SYSTEM

The Moretrench wellpoint system for meeting the problems of wet excavation is described in literature which the Moore Trench Machine Co., Rockaway, N. J., will be glad to send on request.

MORE LIGHT AT LESS COST

National Carbide Sales Corp., 342 Madison Ave., New York, will be glad to send to those interested complete information in regard to the Carbide lanterns which give a dependable, strong, clear and penetrating light at less cost.

A COMPLETE LINE OF HOISTS

Literature describing the Mundy steam, gas and electric hoists, dredge hoists, belt hoists, ship, cargo and dock winches, capstans and cableways may be secured from J. S. Mundy Hoisting Engine Co., 722-740 Frelinghuysen Ave., Newark, N. J.

LARGE YARDAGE ON LONG HAULS

A 96-page illustrated catalog describing the Sauerman power drag scraper with which one man can excavate from 100 to 4,000 cubic yards of earth or gravel per day and move this material to a hopper or pile, may be secured from Sauerman Bros., Inc., 464 S. Clinton St., Chicago, Ill.

BRAND YOUR TOOLS

Everhot branding irons for marking tools, wheelbarrows and other equipment to prevent their loss are described in literature which the Everhot Mfg. Co., Maywood, Ill., will be glad to send on request.

DRILLS AND DRILL TOOLS

The Sanderson Cyclone Drill Co., Orrville, Ohio, will be glad to send on request a catalog describing its line of drills and drill tools for every kind of blast hole drilling.

BITUMINOUS DISTRIBUTORS

Literature describing the Hvass bituminous distributors as well as heavy duty trailers, sand and chip spreaders, sweepers, sprinklers and heating kettles, may be secured from Charles Hvass & Co., Inc., 508 East 19th St., New York.

A NEW HIGH-LIFT GRADER

The new Rome high-lift grader, which is a bank sloper, is described in literature which those interested may secure from the Rome Manufacturing Co., Rome, N. Y.

VERTICAL AND UNDERBODY HYDRAULIC HOISTS

St. Paul vertical and underbody hydraulic hoists for light or heavy trucks which offer serviceability and stamina are described in literature which the Hydraulic Hoist Mfg. Co., St. Paul, Minn., will send on request.

DELAVAUD CAST IRON PIPE

The deLavaud handbook containing complete information in regard to deLavaud pipe, the method of its manufacture by means of casting it in a rapidly revolving cylindrical mold and its fittings may be secured from the United States Pipe & Foundry Co., Burlington, N. J.

A COMPLETE LINE OF HOISTS

Clyde Iron Works Sales Corp., Duluth, Minn., will be glad to send on request complete information in regard to Clyde hoists which are designed and built for performance and service.

JACK FOR ENGINEERS AND CONTRACTORS

Simplex lever jacks, pipe pushers, trench braces and Simplex screw jacks with a visible screw are described in literature which Templeton, Kenly & Co., Chicago, Ill., will be glad to send on request.

A NEW HIGHWAY SURFACER

The new Berg Hi-Way surfacer which eliminates the use of expensive equipment and large crews of men and which is effective on new or old roads of either concrete or concrete asphalt is described in literature which the Concrete Surfacing Machinery Co., Winton Place, Cincinnati, Ohio, will send on request.

MAGNETOS FOR CONSTRUCTION EQUIPMENT

Eisemann Magneto Corp., 165 Broadway, New York, will be glad to send complete information in regard to Eisemann magnetos for use on construction equipment.

ERECTION DATA FOR ROOFING

A new booklet, "Erection Data and Specifications on Truscon Ferrobord Armo Ingot Iron Roofdeck," explaining to the roofing contractor how to install Ferrobord metal roofdeck quickly and economically, may be secured from Truscon Steel Co., Youngstown, Ohio.

NEW STEEL RAILS FORMS

Lakewood Engineering Co., Cleveland, Ohio, will be glad to send to those interested literature describing the Lakewood Duo-Rail forms for use in road form construction.

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